Meridian 1

Multifrequency Compelled Signaling

Description, Hardware and Engineering

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About this guide

Reference list

The following are the references in this section:

- *Meridian 1 system installation procedures (553-3001-210)*
- *X11 Administration (553-3001-311)*
- *X11 System Messages Guide (553-3001-411)*
- *X11 Maintenance (553-3001-511)*

The Multifrequency Compelled Signaling Guide provides descriptions, hardware information and engineering guidelines for signaling protocols based on Multifrequency Compelled Signaling (MFC). Information on the features supported by these signaling systems is also provided in this book.

Included herein are the MFC dependent signaling systems R2MFC and Multifrequency Signaling for Socotel. The features supported by MFC and R2MFC are included as part of this guide.

How this guide is organized

The Multifrequency Compelled Signaling Guide has been arranged in the following sections:

— *R2MFC signaling and basic features* - describes R2/MFC signals and includes basic features

— *R2MFC and MFC features* - begins a section of R2/MFC and MFC related features and includes descriptions and implementation instructions for each feature

— *Multifrequency signaling for Socotel* - describes MFC signaling protocol for Socotel

— *Hardware description* - describes the hardware used for MFC signaling

— *Engineering information* - describes the engineering requirements for MFC signaling

Related documents

This book contains a comprehensive description of the MFC and R2MFC features as they apply to the Meridian 1. Refer to the following documents for more detailed information on installation, administration and maintenance of the MFC signaling package:

— *Meridian 1 system installation procedures (553-3001-210)*

— *X11 Administration (553-3001-311)*

— *X11 System Messages Guide (553-3001-411)*

— *X11 Maintenance (553-3001-511)*

R2MFC signaling and basic features

R2 Multifrequency Compelled (MFC) signaling is an optional software/hardware package available with Generic X11 software.

MFC is a signaling protocol that allows a Meridian 1 to exchange information with another Meridian 1, or a Central Office (CO)/Public Service Telephone Network (PSTN). In addition to providing a medium for transmitting called address digits, MFC offers both exchanges an extensive set of signals describing the status and category of the calling and called parties.

Software

The software package 128 (optional) provides R2MFC signaling for Direct Inward Dialing (DID) or TIE trunks.

Hardware

MFC signaling requires the Meridian 1 to be equipped with MFC Sender/Receiver (MFC S/R) circuit cards.

MFC signals

The MFC feature uses CCITT R2 signaling to establish communication between a Meridian 1 and a CO/PSTN (DID operation) or between two Meridian 1s (TIE operation). It can also be configured to provide Chinese No. 1 Signaling, R2MFC signaling for India (India Phase 2) and Multifrequency Shuttle signaling in CIS.

Forward signals

These consist of signals transmitted from the originating end to the terminating end. There are two groups:

— Group I "Forward" signals are dialed address digits which identify the called party.

— Group II "Forward" signals identify the category of the calling party (e.g., Restricted Station).

Backward signals

These consist of signals transmitted from the terminating end to the originating end. There are two groups:

— Group A "Backward" signals are the response to the Group 1 "Forward" signals.

— Group B "Backward" signals identify the status of the called party (e.g., Station Busy).

The MFC Signals are combinations of two out of a set of six possible frequencies. Two different sets of frequencies are used, one for "Forward" signals, and one for "Backward" signals (Refer to Table 1). The number of possible frequency combinations is given in Table 2.

Table 1
MFC Frequency values

Frequencies	Backward signals (Hz)	Forward signals (Hz)
f0	1140	1380
f1	1020	1500
f2	900	1620
f3	780	1740
f4	660	1860
f5	540	1980

Table 2
MFC frequency combinations

Combination number	Frequencies
1	f0 + f1
2	f0 + f2
3	f1 + f2
4	f0 + f3
5	f1 + f3
6	f2 + f3
7	f0 + f4
8	f1 + f4
9	f2 + f4
10	f3 + f4
11	f0 + f5
12	f1 + f5
13	f2 + f5
14	f3 + f5
15	f4 + f5

Multifrequency Compelled signals are sent over the regular talking channels and are transmitted as readily as speech. Each Forward Signal sent on a trunk is steadily maintained until acknowledged by a Backward Signal. When the Backward Signal is received, the Forward Signal is removed which in turn forces the Backward Signal to be removed as well. This "compelled" sequence is repeated until the protocol is complete and the call is established. Backward signals can also be sent in pulse form without the prior reception of a Forward signal.

The application of the MFC feature is compatible with the line signaling methods available with DID and TIE trunks. Line signalling involves the procedures required for trunk seizure, answer and disconnection. Trunk seizure is immediate. Standard CCITT R2 protocols recommended for CO/PSTN operation are slightly modified for DID/TIE trunk operation.

R2MFC signals are defined by the fact that they are programmable in terms of frequency combinations. This allows users to assign them to suit their particular needs. R2MFC signals are assigned a function within a signaling level (Group I and Group A signals constitute Level 1 Forward and Backward signals respectively and Group II and Group B are Level 2 Forward and Backward signals). A signaling level is a set of signals used to connect to a user on a different switch. Level 1 signals are used for exchanging called party and calling party address information. Level 2 signals are used for exchanging calling party and called party status. Each MFC route is associated with a data block containing the R2MFC signal functions required and supported for the route. When required, two levels are sequentially used through an R2MFC protocol.

Further flexibility is provided by associating an R2MFC table with each MFC route. Up to 127 tables can be defined on a system basis. An R2MFC table contains one or two levels. Each level in a table contains up to 15 Forward and 15 Backward signals representing up to 30 signals.

SMFC signals

Semi Compelled MFC has been introduced to reduce signaling times in large areas that are serviced by satellites. When Semi Compelled MFC (SMFC) is enabled, the MFC backward signals (A and B) are sent for 150 ms instead of waiting for forward signals (I and II) to terminate. The system will be able to handle backward pulsed signals in the range of 150 ms ± 20%.

When the prompt SMFC has been set to YES in the R2MFC incoming table, backward signals will be sent for 150 ms. When the prompt SMFC is set to YES in the R2MFC outgoing table, the system will recognize pulsed signals of 150 ms.

Signal functions

Refer to Table 3 and the following descriptions for detailed information on signal function mnemonics.

Table 3
Functions for MFC signals
(Incoming and Outgoing tables for DID/TIE routes) (Part 1 of 2)

Group	Function Mnemonic	Description of mnemonic
The TFST function will be transmitted in only certain applications.		
Forward Level 1 Group 1	DGT1 – DGT9	digits 1 to 9
	DGT0	digit 0
	ECNI EODL	CNI (Calling Number Identification) end of dialing end of CPN (Calling Party Number) request not accepted
Backward Level 1 Group A	CCN1	send category send 1st CNI digit send next CNI digit
	COMP	address complete, next group
	CONG	congestion
	FAIL	call failure
	NEXT	send next digit (fixed value)
	SCAT	send category
	SCNI	send 1st CNI digit send next CNI digit
	TERM	terminated
	TFST	tandem, send first digit (See Note)
	TNM1*	send last but one digit
	TNM2*	send last but two digits
	TNM3*	send last but three digits
	TNXT*	tandem, send next digit
	VACO	vacant office

Table 3
Functions for MFC signals
(Incoming and Outgoing tables for DID/TIE routes) (Part 2 of 2)

Group	Function Mnemonic	Description of mnemonic
Forward Level 2 Group II	OPER	operator/attendant
	NOPR	subscriber no priority
	PRIO	subscriber with priority
	REST	restricted station
	RICA	route incoming call to attendant
	TOBI	toll operator break in
	TOLL	toll call
Backward Level 2 Group B	BUBA**	busy (break in allowed after TOBI)
	BUBN**	busy (break in not allowed after TOBI)
	BUSY	station busy
	CONG	congestion
	FAIL	failure
	IDCT	idle call trace
	IDLE	station idle
	OUTT	station out of order
	VACC	vacant number

* Function will not be transmitted. (Receive only)
** Function will not be received. (Transmit only)

Signaling level 1 for DID/TIE trunk

Level 1 forward signals (Group I) digit 0–9

Compelled interregister signaling must always begin with a Level 1 forward signal. The following signals apply to Group I.

Digit 0-9

These numerical signals indicate the address required for setting up a call. Such address signals are sent by the CO/PSTN either spontaneously and immediately after the seizure of the trunk or in response to one of the backward signals requesting address digits.

End Calling Number Identification (CNI)

This non-numerical signal indicates the end of forward CNI digits. The sending office will respond with this signal to a request for another CNI digit when all CNI digits have been forwarded or when the CNI is not available.

If the R2MFC to DPNSS Gateway feature is not enabled, CNI is not supported for TIE trunks. A CNI request on a TIE trunk will result in a CNI not available (ECNI) message. If the R2MFC to DPNSS feature is enabled, CNI is supported.

End of dialing

This non-numerical signal indicates the end of a sequence of forward inter-register signals. The sending CO/PSTN will respond with this signal to a request from a Meridian 1 for another digit.

Level 1 backward signals (Group A)

These signals are required to acknowledge Level 1 forward signals and, under certain conditions, Level 2 forward signals. They also convey signaling information as detailed below.

Send next digit (n + 1)

This signal requests transmission of the next digit (n + 1) after reception of digit n.

Address complete, next group

This signal indicates that the incoming end needs no additional address digit and is about to transmit Level 2 backward Group B signals.

Congestion

This signal indicates network blocking or unsuccessful termination.

Call terminated

If, after receiving all digits, the Meridian 1 does not require the calling party category, this signal is sent to the originating end thus discontinuing the MFC sequence.

Send category

This signal requests the originating party's information as a Level 2 forward signal.

Tandem call send first digit

This signal requires that the first digit be sent again because an alternate route is to be tried at a tandem PBX.

Tandem call send next digit

This signal indicates that a tandem PBX has been encountered, a speech path has been set up, and the next address digit should be sent.

Call failure

This signal indicates that the call failed due to time-out expiry, insufficient digits to identify the called station, or an invalid number.

Send CNI

This signal is used for the following two purposes:

— send 1st CNI digit

— send next digit

The specific purpose is determined by the point in the sequence at which the receiving exchange detects the signal.

Category and CNI

This signal is used for the following three purposes:

— send Group II signal (no changeover)

— send 1st CNI digit

— send next CNI digit

The specific purpose is determined by the point in the sequence at which the receiving exchange detects the signal.

Send last but one digit

This signal is used to request the sending of digit (n-1) after reception of digit n.

Send last but two digit

This signal is used to request the sending of digit (n-2) after reception of digit n.

Send last but three digit

This signal is used to request the sending of digit (n-3) after reception of digit n.

Signaling level 2 for DID/TIE trunks

Level 2 Forward signals (Group II)

The Level 2 forward signals are calling party's category signals sent by the originating end in response to a request by the terminating end. The following signals apply to Group II.

Subscriber no priority

In response to a request from a Meridian 1 for the calling party category, the originating office will notify the Meridian 1 that the call should be treated as a normal call. Calls from maintenance equipment or calls used for data transmission are treated as "Subscriber No Priority."

Subscriber with priority

This signal indicates that the call has been originated from a subscriber's line to which priority status is assigned. In case of an unsuccessful termination the call will be optionally rerouted to the operator.

Operator call

This signal indicates that the call is placed by an operator and will optionally be routed to an attendant when termination on an idle station is not possible.

Restricted station

This signal indicates that the call originated from a restricted station (i.e., SRE, FRE, FR1, FR3).

Route incoming calls to attendant

This signal routes DID calls, such as those from a toll operator, to a Meridian 1 attendant.

Toll operator Break In

This signal indicates that the call is placed by a toll operator and "Break In" is requested if the destination is busy on a non-toll call.

Toll operator

This signal indicates that the call is placed by a toll operator.

Level 2 Backward signals (Group B)

These signals are required to acknowledge Level 2 forward signals. They also convey signaling information as indicated below.

Station idle

This signal indicates that the called station is idle.

Station busy

This signal indicates that the called station is busy.

Congestion

The Meridian 1 will return this signal indicating that a network blocking condition has been encountered.

Station out of order

The Meridian 1 will return this signal when the called party is maintenance busy.

Vacant number

This signal indicates that the address is invalid or has not been allocated.

Failure

This signal indicates a call failure due to time-out.

Idle call trace

This signal is used to initiate an automatic "Malicious Call Trace" procedure in the CO/PSTN. Although the "Idle Call Trace" function may be defined, it is not at present supported.

Busy, Break-in is allowed

This signal indicates that the called party is busy on a non-toll call and Break In is permitted. It is in reply to the Forward Level 2 "Toll Operator Break In" signal.

Busy, Break-in is not allowed

This signal indicates that the called party is busy on a toll call or break in is not permitted. It is in reply to the Forward Level 2 "Toll Operator Break In" signal.

MFC DID/TIE operation

Incoming DID/TIE calls

The following steps outline the sequence of events when a call is received on an incoming MFC DID/TIE trunk.

a An incoming MFC DID/TIE trunk is seized.

b A search is performed until an MFC S/R is found. If there is no MFC S/R available, the request to obtain one is linked into the waiting queue.

c When an MFC S/R is found and attached to the trunk, a "Valid Origination" timer is started and a Forward Group I signal is expected. If the timer expires before a signal (DGT0–9) is received, then overflow tone is returned for 30 s, after which the trunk is locked out. This timer is programmable on a route basis as "MFC" timer.

d When the signal is received, the timer is canceled.

An attempt is made to terminate the call with the received digit. One of the following Group A Backward signals is returned according to the status of the call after the attempt.

Incomplete call

If more address digits are required, a Send Next Digit signal is returned. The "end of dialing" (MFC) timer is started. If the timer expires before the next digit is received, the MFC S/R is released, and the trunk is locked out.

Call intercepted

The call cannot be terminated due to network blocking (congestion). After a Congestion signal is sent to the originating end, the MFC S/R is released, and the trunk is locked out.

Call failure

The call cannot be terminated due to an end of dialing (MFC) time-out, or insufficient digits have been received to identify the called party after receiving an end of dialing signal, or the number of digits received is invalid. After a Call Failure signal is sent, the MFC S/R is released, and the trunk is locked out.

Tandem call

If the call is successfully routed to another MFC trunk route, a Tandem Call signal is returned indicating to the originating end that the next digits are expected. The end of dialing (MFC) timer is started.

Call terminated

When the last signal received is an end of dialing signal, and Group II signals are not defined for the route, the terminating station is notified. After a Call Terminated signal is returned to the originating end, the MFC S/R is released, and an indication tone (ringback, busy, etc.) is returned.

Address complete

When the last signal received was an end of dialing signal, and Level 2 signals are defined for this route, an Address Complete signal is sent. The end of dialing (MFC) timer is set. When one of the Group II Forward signals is received, the protocol is completed by sending one of the following Group B Backward signals.

Station busy

The terminating station is busy. After this signal is sent, the MFC S/R is released, busy tone is returned for 30 s, after which the trunk is locked out.

Congestion

A blocking condition is encountered. After this signal is sent, the MFC S/R is released, busy tone is returned for 30 s, after which the trunk is locked out.

Vacant number

The dialed number is invalid. After this signal is sent, the MFC S/R is released, overtone is returned for 30 s, after which the trunk is locked out.

Station idle

The called station is idle. The calling station is notified. After this signal is sent the MFC S/R is released, and an indication tone is returned to the originating end.

Call failure

A partial dialing condition has been found. After this signal has been sent, the MFC S/R is released and the trunk is locked out.

The MFC S/R used for the incoming trunk is released within 30ms after detecting the cessation of the Group B Backward signal. When applicable, a speech path is enabled 75ms (minimum) after the MFC S/R has been released.

R2MFC Incoming DID/TIE calls terminating on a CDN

Release 21 introduces the capability to terminate MFC calls on a CDN.

Normal operation

The following table lists the R2MFC Group B Backward signals returned by the Meridian 1 upon successful completion of the *first* CCR request on an incoming R2MFC call.

Table 4
CCR Treatment/MFC Signal Mapping (Part 1 of 2)

CCR/HER treatment	R2MFC Group B signal	Comment
DEFAULT	"STATION IDLE"	Signal returned when the call terminates directly on an ACD queue.
QUEUE TO	"STATION IDLE"	
ROUTE TO	it depends	Signal must identify the status of the party to whom the call has been routed.
FORCE BUSY	"STATION BUSY" or "BUSY, BREAK IN NOT ALLOWED"	Allows the faster release of resources involved in the unsuccessful call.
FORCE OVERFLOW	"CONGESTION"	
FORCE DISCONNECT	"STATION IDLE"	The call is answered before the forced disconnect.

Table 4
CCR Treatment/MFC Signal Mapping (Part 2 of 2)

CCR/HER treatment	R2MFC Group B signal	Comment
GIVE IVR	"STATION IDLE"	Dialing phase successfully completed.
GIVE MUSIC	"STATION IDLE"	
GIVE RAN	"STATION IDLE"	
GIVE RINGBACK	"STATION IDLE"	
GIVE SILENCE	"STATION IDLE"	

Abnormal operation

CCR time-out: As with other calls, R2MFC calls receive default treatment. If the incoming call notification fails to be acknowledged within a non-configurable time (4 or 6 seconds), the call is placed in the default ACD queue and the "STATION IDLE" is returned.

MFC time-out: An R2MFC call may be aborted by either end if any signal fails to be acknowledged within the configured time. If an R2MFC route may convey calls to a CDN in controlled mode, the corresponding MFC timer should be increased to a value superior to the CCR timer.

Failure to provide treatment: If for any reason a CCR request fails to complete, the call will not be automatically disconnected. In most cases a default treatment i.e., ringback tone, is given. If this is the first CCR request, the "STATION IDLE" signal is returned. If the request fails with no treatment, no Group B signal is returned.

Outgoing DID/TIE calls

The following steps outline the sequence of events when a call is placed over an outgoing MFC TIE trunk.

a The access to an outgoing MFC DID/TIE trunk is dialed.

b An idle trunk is seized.

c The first digit (after the access code) is dialed. This initiates a search for an idle MFC S/R and its corresponding path to the trunk. If no MFC S/R is available, the request to obtain one is placed in a queue until an MFC S/R is found or the call is canceled.

d When the MFC S/R is found, the dialed digit is translated into one of the predefined Forward Group 1 signals (DGT0 to DGT9) and sent over the trunk.

e A "Signal On" timer is set.

f When a Backward Group A signal is received from the far end, the "Signal On" timer is canceled and a "Signal Off" timer is set. The "Signal Off" timer remains on until the Backward Group A signal is removed.

Note: If either the "Signal on" or the "Signal off" timer expires, the compelled sequence is considered to be broken. The sequence is canceled, the MFC S/R is released, and the trunk is disconnected. Overflow tone is returned to the originating station. These timers are programmable on a route basis as "MFC" timer.

When one of the following Group A Backward signals is received, the call is processed according to the function assigned.

Send next digit

The next digit dialed is sent through the trunk following the same sequence as described above. If the next digit is not available, the trunk is put in a "no-outpulsing" condition and an end of dialing (MFC) timer is started. If this timer expires, an end of dialing signal is sent. If another digit is dialed before the timer expires, the timer is canceled; the digit is immediately sent and the timer is restarted.

Congestion

The terminating end has encountered network blocking (i.e., no speech path available). The R2MFC sequence is ended, the MFC S/R is released, the trunk is disconnected, and overflow tone is returned to the originating end.

Send category

The terminating end requests the originating party's status. One of the Group II Forward signals is sent to the terminating end. One of the Group B Backward signals is expected in response, and when received, the call is treated accordingly.

Call terminated

The terminating end has successfully completed the call, the speech path between the originating and terminating parties is enabled, the R2MFC sequence is ended, and the MFC S/R is released.

Call failure

The terminating end has failed to complete the call. The R2MFC sequence is ended, the MFC S/R is released, and the trunk is disconnected. The call is given an intercept treatment according to the originating party's information.

Tandem Call, send first digit

The terminating end requests the first digit after a route access code.

Tandem Call, send next digit

The terminating end has recognized the access code to an outgoing route as a tandem call and is requesting the next digit.

Address complete

The terminating end has completed the call and has changed over to send Group B Backward signals. If Group II is defined for the route, one of the Group II Forward signals is sent according to the originating station identification (station or attendant).

One of the following Group B Backward signals are expected from the terminating end. The call is then treated accordingly.

Station busy

The terminating station is busy. The R2MFC sequence is ended, the MFC S/R is released, the trunk is disconnected, and busy tone is returned to the originating end.

Congestion

A blocking condition is encountered at the terminating end. The R2MFC sequence is ended, the MFC S/R is released, the trunk is disconnected, and overflow tone is returned to the originating end.

Vacant number

The terminating end has intercepted the call (i.e., a vacant number was dialed). The R2MFC sequence is ended, the MFC S/R is released, the trunk is disconnected, and overflow tone is returned to the originating end.

Station idle

The called station is idle, the terminating end notifies the called station and returns the corresponding indication tone. The R2MFC sequence is ended, the MFC S/R is released, and the speech path is set up.

Call failure

The terminating end has encountered a partial dial condition, or the signal processor has failed. The R2MFC sequence is ended, the MFC S/R is released, the trunk is disconnected, and overflow tone is returned

The MFC S/R used at the outgoing trunk is released within 30 ms after detecting the cessation of the last backward signal received. When required, a speech path is enabled within 75 ms after the MFC S/R used has been released.

Tandem call procedures

MFC incoming to MFC outgoing

The incoming trunk has a MFC S/R circuit card attached from the moment the call was originated. A Backward signal is sent after the received signal is processed. When a route access code is recognized and an outgoing trunk is successfully seized, one of the two following tandem treatments may occur.

(a) End-to-End Signaling

If both routes are using the same R2 data block, or different data blocks with the same end to end signaling code (EECD), then End to End signaling is provided. A Send Next Digit signal is returned to the originating Meridian 1. After this signal has been sent, the MFC S/R is released, and a speech path is set up between the outgoing and incoming trunks. End to End signaling between the originating and terminating Meridian 1 proceeds through this speech path.

(b) Buffered Signaling

If the R2 Data associated with each route is different, Forward signals received from the originating end must be translated to that required for the terminating end. Two MFC S/Rs are required for this type of tandem connection.

Each successive Group I signal received at the tandem Meridian 1 is collected and acknowledged. When all the required signals have been received, the tandem Meridian 1 initiates a signaling protocol with the terminating end until the address phase is complete. At this point a change over to the second MFC level may occur, or one of the following call set up situations.

— If the outgoing call has been terminated by either the terminating or tandem Meridian 1, and no further information exchange is required the MFC S/Rs are released.

— If at any time the originating end cancels the call, or the tandem Meridian 1 aborts the call, both MFC S/Rs are released the outgoing trunk is disconnected and the incoming trunk is locked out.

— If the outgoing call is aborted by either the tandem or terminating end, the MFC S/R attached to the outgoing trunk is released. A Call Failure signal is sent to the originating end and the trunk is locked out.

— If the end of dialing (MFC) timer expires at the incoming trunk, the MFC S/R is released, and an end of dialing signal is sent to the terminating end.

After the call has been set up and more information is required to complete the call, the signaling protocol is changed over to the next level. The signal requesting more information is repeated towards the originating end. When the requested information is received it is relayed to the terminating end. This protocol is repeated until the call is established.

Call failure

If the outgoing call is aborted by the tandem or terminating end, the MFC S/R attached to the outgoing trunk is released. A Call Failure signal is returned to the originating end and the incoming trunk is locked out.

MFC incoming to Non-MFC outgoing

The digits received on the incoming trunk are buffered by the tandem Meridian 1. Each digit is immediately acknowledged by a Send Next Digit signal. The collected digits are sent to the terminating end using the specified signaling (DTN, DIP, etc.). If an EOD time-out occurs at the incoming trunk, the MFC S/R is released and the state of the outgoing trunk depends on the digits already sent.

In the case of an outgoing trunk, when dialing the trunk access codes, the DN and no octothorpe (#), the default values for the MFC timer (12032 ms) and the EOD timer (13953 ms) result in a timeout of the MFC timer if the call is not answered before the MFC timer times out. This condition causes the ringing to stop and the call is disconnected. Changing the value of one of these timers such that the MFC timer setting exceeds the EOD timer setting will allow the backward message "address complete" to be sent.

Non-MFC incoming to MFC outgoing

This type of call is treated as though the call originated from a station at the tandem Meridian 1.

R2 modification

The R2 Modification (R2MOD) feature allows the terminating end of a call to suppress the sending of the "NEXT" signal after a user specified number of digits have been received.

This feature is normally used at a tandem node in buffered mode. Tandem would normally send a "NEXT" signal after "N" digits have been received, even though "N" digits are enough to terminate the call. This is because the "COMPLETE" signal is not propagated back from the terminating end in time. In some cases, the CO/PSTN is not expecting the "NEXT" signal after the "N" digit. This feature will suppress it.

CNI feature

The Calling Number Identification (CNI) feature allows the terminating end of a call (Meridian 1) to request and receive the Calling Party Number (CPN) from the originating end (CO/PSTN). This applies to DID and incoming trunks employing R2MFC signaling.

CNI operation

The signal "Send Category" (SCAT) is used to request the calling party category (CPC) and prevent the CO/PSTN from changing over to expect Group B signals. On receipt of the CPC, the Meridian 1 will send "SCNI" (send 1st CNI digit). If the CPN is not available the CO/PSTN will return "ECNI" (CNI not available). Otherwise it will return the 1st digit. The Meridian 1 will then send "SCNI" again with the second interpretation (send next CNI digit).

The "CCNI" signal and its three interpretations (send category, send 1st CNI digit, send next CNI digit) can also be used, if required, to request the CPN. However, both methods should not be defined since the "CCNI" signal takes precedence over the "SCAT" and "SCNI" signals.

Once the CPN sequence is completed with an "EODL" (end of CPN) signal from the CO/PSTN, a second party category is sent using the signal "COMP" (address complete, next group).

CNI transmission adaptation

During an outgoing MFC call, when the SCNT prompt has been set to YES in the R2MFC outgoing table, if the system receives a NEXT signal (configured as TNM1, TNM2, or TNM3) during CNI transmission, it will abort the CNI transmission, and resume transmitting the called number.

CNI request options

The R2MFC to DPNSS Gateway feature provides the following enhancements to the R2MFC incoming CNI request functionalities.

— Provides an option to request CNI for an incoming R2MFC call immediately after a pre-determined number of address digits are received.

— Provides an option to request CNI for an incoming R2MFC call immediately after an ESN code is dialed.

Backward signal suppression feature

The Backward Signal Suppression (BSSU) feature allows the suppression of backward signals under error conditions (e.g., the "FAIL" signal). This option is used by a (CO/PSTN) which does not recognize these signals. If this feature is active, the Meridian 1 will not abort the call under error conditions (e.g., time out); the trunk will be held up until the CO/PSTN times out and disconnects.

Calling Number Display Restriction

With the Calling Number Display Restriction (CNDR) feature, Calling Line Identification (CLID) information can be denied or allowed for calls over R2MFC trunks.

The CNDR feature provides the following functionalities:

— restricts/allows the display of CLID information for calls over R2MFC trunks

— overrides the display restriction for emergency incoming calls

— outpulses the asterisk (*) and octothorpe (#) to a Central Office (CO) over R2MFC trunks

Restricting the display of CLID information

The CNDR feature uses the Calling Party Number and Name per-line Blocking Allowed (CLBA) and the Calling Party Number and Name per-line Blocking Denied (CLBD) Class of Service options in Overlays 10 and 11. CLBA restricts CLID information from being displayed on the terminating set. CLBD allows CLID information to be displayed on the terminating set.

The following two scenarios describe how the user of the originating set restricts this CLID information from being displayed on the terminating set.

Call scenario 1

The originating set has CLS = CLBA in Overlay 10 or 11. When the user of the originating set places a call over an R2MFC trunk, the CLID information is not displayed on the terminating set.

Call scenario 2

The originating set has CLS = CLBD in Overlay 10 or 11. The user of the originating set dials the Calling Party Privacy (CPP) Flexible Feature Code (FFC) (defined in Overlay 57) before dialing the Directory Number (DN) of the terminating set. The CLID information is not displayed on the terminating set.

Emergency calls

If a call arrives in on an Emergency route, its CLID information is displayed regardless of the received signal (that is, "Display Allowed" or "Display Denied").

Outpulsing the asterisk (*) and octothorpe (#)

The CNDR feature treats the asterisk (*) and the octothorpe (#) as dialed digits. The asterisk (*) and the octothorpe(#) are outpulsed using signals defined for the CNDR route interface (see Table 6 on page 39). The user has to simply dial the asterisk and octothorpe as normal digits.

R2MFC signals

CLID is transmitted for all calls. Whether the CLID information is displayed on the terminating set depends on the R2MFC signal received by the terminating set. The received signal can be either "Display Allowed" or "Display Denied".

For outgoing calls, a "Display Allowed" signal is sent in the following situations:

— when CLS = CLBD on the originating set

— when CLS = CLBA on the originating set, and the user dials the Calling Party Privacy Override (CPPO) FFC prior to dialing the DN of the terminating set

A "Display Denied" signal is sent in the following situations:

— when CLS = CLBA on the originating set

— when CLS = CLBD on the originating set, and the user dials the CPP FFC prior to dialing the DN of the terminating set.

For incoming calls, CLID information is displayed on the terminating set when the "Display Allowed" signal is received. CLID information is restricted when the "Display Denied" signal is received. When the "Display Denied" signal is received, the terminating set displays the Access Code (ACOD) minus (-) the Member Number of the incoming route.

Table 5 summarizes the signal and display information for the CNDR feature.

Table 5
CNDR display and signal information

Originating CLS	FFC dialed	Signal sent	Terminating Emergency Conference	Display on terminating set
Any	Any	Any	Yes	CLID
CLBD	None	I 12	No	CLID
CLBD	CPP	I 15	No	ACOD - Member #
CLBD	CPPO	I 12	No	CLID
CLBA	None	I 15	No	ACOD - Member #
CLBA	CPP	I 15	No	ACOD - Member #
CLBA	CPPO	I 12	No	CLID

Internetworking

R2MFC CNDR Route to R2MFC standard

When a call from the CNDR route tandems over a standard R2MFC network, the following translations are performed:

— The "Display Denied" and "Display Allowed" signals received on the CNDR route are translated to ECNI signals.

— The asterisk (*) and octothorpe (#) are both translated to EODL before being sent over the standard R2MFC network.

Note: When a call leaves the CNDR network and enters a standard R2MFC network, the CLID is always displayed on the terminating set, due to the performed translations.

R2MFC Standard to R2MFC CNDR Route

The ECNI signal received on the originating side is translated into the "Display Allowed" signal and sent to the terminating CNDR route.

R2MFC CNDR Route to ISDN network

The setup message sent to the ISDN side is manipulated as follows:

— When a "Display Restricted" signal is received, the Presentation indicator is set to "Presentation Restricted" in the setup message sent from the tandem node.

— When the "Display Allowed" signal is received, the Presentation indicator is set to "Presentation Allowed" in the setup message sent from the tandem node.

— The asterisk (*) and octothorpe (#) signals are translated based on existing call processing.

ISDN to R2MFC CNDR Route

The "Display Denied"/ "Display Allowed" signal is sent over R2MFC trunks based on the Presentation Indicator field on the incoming setup message. The Presentation Indicator is set to either "Presentation Restricted" or "Presentation Allowed". The Presentation Indicator field is set to "Presentation Denied"/ "Presentation Allowed" in the setup message received at the tandem node.

Operating parameters

The CLBA/CLBD Classes of Service apply to analog (500/2500 type) sets and Meridian 1 proprietary sets.

The CNDR feature restricts the display of CLID information on the terminating set only. It does not restrict its appearance, for instance, in Call Detail Recording (CDR) records.

The CNDR feature introduces four signals. Table 6 contains the signals defined for the CNDR feature.

Table 6
Signals introduced for the CNDR feature

Frequency Index	Definition
Incoming table: Level 1: RECV	
11	"*" (ASTX)
12	Display Allowed (DPAL)
13	"#" (POND)
15	Display Denied (DPDN)
Outgoing table: Level 1: XMIT	
11	Digit "*" (ASTX)
12	Display Allowed (DPAL)
13	Digit "#" (POND)
15	Display Denied (DPDN)

When one side of the route (for instance, the originating route) is configured with standard MFC and the other side (for instance, the terminating side) is configured with CNDR tables, the call can be completed. However, the call will not be completed if the call originates on the CNDR side and DPAL, DPDN, ASTX, or POUND signals are sent to the MFC side.

A Meridian 1 connected to the CO can outpulse the asterisk (*) and octothorpe (#) as dialed digits. However, a Meridian 1 cannot tandem a call to another network from the CO when the asterisk (*) and octothorpe (#) are received as dialed digits. They are translated to EODL on a standard R2MFC network.

> ***Note:*** For the purpose of this feature document, CO refers to a Central Office that supports CNDR routing.

When a Meridian 1 is connected to the CO and acts as a tandem node, the "Display Allowed" and "Display Denied" signals received from the CO are translated into "End of CNI" for an R2MFC network and "Presentation Allowed" for an ISDN network.

Feature interactions

Attendant Console

If an attendant wishes to restrict the display of a number, they must dial CPP FFC + Destination DN. No special Class of Service is provided in Overlay 12.

Autodial

Autodial honors the CNDR feature. For example, the stored FFC and Class of Service are considered before the "Display Allowed"/ "Display Denied" signal is sent.

Call Detail Recording

The CNDR feature does not change the format of CDR output.

Call Forward

When an incoming call is forwarded to another local set, the display of the set acts as if the call has arrived directly on that set. When an incoming call is forwarded over a trunk, the CNDR is honored only when the outgoing trunk is either ISDN or a similar CNDR route. The CNDR tandems over ISDN as "Presentation Restricted". If a call comes in on an emergency route and is then forwarded, it always displays its CLID information.

Call Transfer

Set A calls Set B across nodes (using CNDR). Set B transfers the call to local Set C. The display of Set C follows that of set B. That is, if set B does not display CLID information, then Set C does not display it either. If the incoming CNDR call is transferred over a trunk, display restrictions do not apply.

Calling Party Privacy

CNDR extends Calling Party Privacy (CPP) functionality over R2MFC signaling trunks. The existing FCC for CPP is used for CNDR. The CPP package is required for the CNDR feature. CNDR provides CPP functionality using MFC signals. When CNDR is configured, CPP is set to NO on CNDR routes.

Conference

No Hold Conference

In a conference, the users' CLID information is not displayed; therefore, there is no interaction with the CNDR feature. In a three party conference, when one party disconnects, the call becomes a normal call. In this case, the display restrictions of the normal call apply.

Dialed Inward System Access

When an incoming call arrives on a set through Dialed Inward System Access (DISA), CNDR is honored. The display on the terminating set depends on the signal received (for non-emergency routes).

Display of Calling Party Denied

Like CPP, CNDR overrides Display of Calling Party Denied (DPD). The display, however, is based on DPD. The display shows ACOD - Member Number.

Last Number Redial

Last Number Redial (LNR) is honored based on the CPP and the CPPO feature. For example, if a call is made using a CPP/CPPO FFC and the next call is dialed using the LNR key, the FFC is honored.

Stored Number Redial

If CPP FFC is stored along with the dialed DN, it is honored based on the Calling Party Privacy (CPP) feature.

Feature packaging

The Calling Number Display Restriction (CNDR) feature requires the following packages:

— Multifrequency Compelled Signaling (MFC) package 128

— Flexible Feature Codes package 139

— Calling Party Privacy (CPP) package 301

Feature implementation

LD 94 – Configure CNDR for an incoming table.

Prompt	Response	Description
REQ	NEW CHG	Add new data. Change existing data.
TYPE	R2MF	R2MFC data block.
ICOG	ICT	Incoming table.
MAXT	(1)-127	Maximum number of tables.
TBNO	1-127	Incoming table number.
...		
SMFC	 (NO) YES	Send MFC. Backward signals are stopped when the forward signal is recognized as having stopped. Backward signals are sent (incoming calls) pulsed for 150 ms. or received (outgoing calls) pulsed 150 ms. +/- 20%.
CNDR	YES	Set the table for the CNDR.
LVNO	1	Level Number 1.
DFLT	0	Default table number 0 (default).
RECV	<CR>	Enter a Carriage Return, <CR> for the default values. The default values are 11 ASTX, 12 DPAL, 13 POND, and 15 DPDN.
...		

LD 94 – Configure CNDR for an outgoing table.

Prompt	Response	Description
REQ	NEW CHG	Add new data. Change existing data.
TYPE	R2MF	R2MFC data block.
ICOG	OGT	Outgoing table.
MAXT	(1)-127	Maximum number of tables.
TBNO	1-127	Outgoing table number.
...		
SCNT	 (NO) YES	Switch CNI on Next. When the NEXT signal is received during CNI transmission on Level 1, the system continues sending the calling number. When the NEXT signal is received during CNI transmission on Level 1, the system switches to called number and then sends the next called number digit.
CNDR	YES	Set the table for the CNDR.
LVNO	1	Level Number 1.
DFLT	0	Default table number 0.
XMIT	<CR>	Enter a Carriage Return, <CR>, for the default values. The default values are: ASTX 11, DPAL 12, POND 13, and DPDN 15.
...		

LD 16 – Configure a CNDR route as an emergency route.

Prompt	Response	Description
REQ	NEW CHG	Add new data. Change existing data.
TYPE	RDB	Route Data Block.
CUST	xx	Customer number.
...		
ROUT	0-511	Route number.
ICOG	IAO ICT	Incoming and Outgoing. Incoming only Trunk.
...		
MFCI	1-127	MFC incoming table number, as defined at the TBNO prompt in LD 94.
...		
MFCO	1-127	MFC outgoing table number, as defined at the TBNO prompt in LD 94. CNDR must be set to YES.
EMGY	YES	Emergency Route. All calls on this route will have their CLID information displayed. NO = Not an Emergency Route (default).
...		

LD 57 – Configure Calling Party Privacy (CPP) Flexible Feature Codes (FFC).

Prompt	Response	Description
REQ	NEW CHG	Add new data. Change existing data.
TYPE	FFC	Flexible Feature Codes data block.
CUST	xx	Customer number.
FFCT	(NO) YES	Flexible Feature Confirmation Tone.
CEPT	(NO) YES	Conférence Européan des Postes Tel. If CEPT = YES, all CEPT defaults are set.
...		
CPP	*67 x...x	Calling Party Privacy code. CPP is prompted only if CPP package 301 is equipped. CPP can be up to four digits, seven with Directory Number Expansion (DNXP) package 150. CPP is reprompted until a Carriage Return, <CR>, is entered. The default value for CPP is *67.
CPPO	x...x	Calling Party Privacy Override code. CPPO can be up to four digits, seven with DNXP package 150. CPPO is reprompted until a Carriage Return, <CR>, is entered.

LD 10/11 – Define the Class of Service for analog (500/2500 type) sets and Meridian 1 proprietary sets.

Prompt	Response	Description
REQ	NEW CHG	Add new data. Change existing data.
TYPE	xxxx	Type of telephone.
TN	l s c u c u	Terminal Number. For Option 11C.
...		
CLS	CLBA (CLBD)	Calling Party Number and Name per-line Blocking Allowed. CLBD = Calling Party Number and Name per-line Blocking Denied (default).

Feature operation

Blocking the display of CLID information

If your set has CLS set to CLBD and you wish to restrict the display of your DN on the terminating set, dial CPP FFC + Terminating set's DN.

If your set has CLS set to CLBA and you wish to restrict the display of your DN on the terminating set, dial the DN of the terminating set.

Note: If you dial CPP FFC + DN when CLS = CLBA, there is no effect. That is, the CLID is still blocked.

Note: If you dial CPP FFC + DN when CLS = CLBD, there is no effect. That is, the CLID is still displayed.

Overriding the blocking of CLID information

If your set has CLS = CLBA and you wish to display your CLID information on the terminating set, dial CPPO FFC + Terminating set's DN.

Including "*" and "#" as dialed digits

The asterisk (*) and the octothorpe (#) are outpulsed using signals defined for the CNDR route interface. To include the asterisk (*) and the octothorpe (#) as dialed digits, just dial them as normal digits.

China Number 1 Signaling

Reference list

The following are the references in this section:

- *Multifrequency Compelled Signaling: Description, Hardware, and Engineering* (553-2861-100)

The following features have been designed to interface with the special needs of the Chinese Public Network.

Many of the features can be used independently of China 1 Signaling, particularly those not involving an external operator.

Active Feature Dial Tone

This capability provides a distinctive dial tone to a station going off-hook when it has one of the following features active:

— Do Not Disturb (DND), or

— Make Set Busy (MSB).

Operating parameters

Active Feature Dial Tone is only supported on fully-supervised analog or 2 mbps digital DID/DOD trunks.

Active Feature Dial Tone is only available on a route basis.

Active Feature Dial Tone is not given when Call Forward (CFW), Message Waiting (MW), or CFW MW dial tone is to be given.

Feature interactions

There are no interactions with other features.

Feature packaging

Active Feature Dial Tone requires the following packages:

— Operator Call Back China #1 (OPCB) package 126

— Multifrequency Compelled Signaling (MFC) package 128

For digital trunks, 2 mbps Digital Trunk Interface (DTI2) package 129 is required, which depends upon International Supplementary Features (SUPP) package 131.

Feature implementation

LD 56 – Modify or change customer's tone and ringing parameters.

Prompt	Response	Description
REQ	NEW CHG	Add new data. Change existing data.
TYPE	FTC	Flexible Tones and Cadences data block.
...		
- ACTN	x xx xx xx	Active Feature Dial Tone.
- - TDSH	i bb cc tt	TDS external, burst, cadence and tone.
- - XTON	0-(4)-255	NT8D17 TDS tone code.
- - XCAD	0-255	NT8D17 TDS cadence code for FCAD.

Feature operation

No specific operating procedures are required to use this feature.

Audible Alarm

This capability provides for an audible alarm which is sounded when an emergency number has been dialed, or when the system is alerted of an incoming malicious call.

Operating parameters

Audible Alarm is only supported on fully-supervised analog or 2 mbps digital DID/DOD trunks.

Audible Alarm is only available on a route basis.

A maximum of 100 emergency numbers can be marked to set off the alarm.

Feature interactions

There are no interactions with other features.

Feature packaging

Audible Alarm requires the following packages:

— Operator Call Back China #1 (OPCB) package 126

— Multifrequency Compelled Signaling (MFC) package 128

For digital trunks, the following package is required:

— 2 mbps Digital Trunk Interface (DTI2) package 129, which is dependent upon:

- International Supplementary Features (SUPP) package 131

Feature implementation

LD 15 – Create or Modify data blocks for customers.

Prompt	Response	Description
REQ	NEW CHG	Add new data. Change existing data.
TTYPE	CDB FTR	Customer Data Block. Release 21 gate opener.
...		
- ALDN	xxxx	Alarm directory number (must be a single-appearance 500-type set DN).
	<CR>	No value when REQ = NEW and no change when REQ = CHG.

Calling Number Identification (CNI) on Outgoing Multifrequency Compelled Signaling

The CNI on Outgoing MFC feature allows Calling Number Identification (CNI) to apply to Direct Outward Dialing (DOD) trunks. Category (CA) codes can be assigned in LD 10, 11 and 94. Both the CA and CNI digits can be sent by the Meridian 1 to the Public Switched Telephone Network (PSTN) upon its request. The PSTN can send CCNI (category and CNI), SCAT (category code) and SCNI (CNI) signals. The CCNI signals may be followed by the CCNI, SCNI or NEXT signals. Refer to *Multifrequency Compelled Signaling: Description, Hardware, and Engineering* (553-2861-100) for additional information.

Operating parameters

The CNI on Outgoing MFC feature is only supported on fully-supervised analog or 2 mbps digital DID/DOD trunks.

The CNI on Outgoing MFC feature is only available on a route basis.

The request for outgoing CNI must be made during LEVEL 1 signaling.

The trunk originating the CNI must have Multifrequency Compelled and Calling Number Allowed Class of Service.

Feature interactions

There are no interactions with other features.

Feature packaging

CNI on Outgoing MFC requires Operator Call Back China #1 (OPCB) package 126.

For digital trunks, the following package is required:

— 2 mbps Digital Trunk Interface (DTI2) package 129, which requires:

- International Supplementary Features (SUPP) package 131.

Feature implementation

LD 10 – Respond to the CAC prompt, by entering the 0-10 Category Code (default is 0) for analog (500/2500 type) telephones.

LD 11 – Respond to CAC prompt, by entering the 0-10 Category Code (default is 0) for Meridian 1 proprietary telephones.

LD 15 – Respond to CNDN prompt, by entering a 1-4 digit customer DN to be sent with the Calling Party DN for CNI. Respond to the CNAT prompt, which appears after the CNDN prompt, by entering a 1-4 digit attendant DN, to be sent with the Calling Party DN when the calling Party is an attendant.

LD 94 – Respond to the CACD prompt, to change the CAC default values if the CAC in LD 10 or LD 11 is set to 0, or to define the LEVEL 2 TOLL signal.

Feature operation

No specific operating procedures are required to use this feature.

Called Party Control

Called Party Control (CDPC) provides the far-end (PSTN operator) of an outgoing call with disconnect control. If the calling party dials a Special Service number that is identified in LD 18, then CDPC is invoked. The calling party can go on-hook and be placed on hold for a designated time (set in LD 16) after talking to the PSTN operator.

This allows the PSTN operator to call back the originating station on the Meridian 1 by sending a special operator signal instead of redialing the complete number. Analog (500/2500 type) telephones must have permanent hold available.

Operating parameters

Called Party Control is only supported on fully-supervised analog or 2 mbps digital DID/DOD trunks.

Called Party Control is only available on a route basis.

Called Party Control is not supported on tandem trunks.

With Called Party Control active on an incoming call, a disconnect received from the originating-end is ignored (until the incoming hold timer has timed out).

During an established incoming call, Called Party Control is activated when an SL-1 telephone user presses the trace (TRC) key, or when an analog (500/2500 type) telephone user dials the Special Prefix (SPRE) code followed by 83 (or equivalent Flexible Feature Code).

For Special Service calls, the calling party must be an ordinary station.

Call Waiting and Camp-on are not allowed to an analog (500/2500 type) telephone which is on an outgoing trunk call that follows a Called Party Control call.

Feature interactions

Attendant Break-In

Attendant Break-In is not allowed on an outgoing Called Party Control call.

Attendant Calls

Called Party Control is denied on Special Service calls if the calling party is an attendant.

Automatic Call Distribution (ACD)

Called Party Control is not supported on the ACD DN key. Called Party Control is supported on calls made by an ACD agent to a Special Service if the calls are made on an IDN key which is not designated as an ACD DN key. ACD agents may still receive incoming ACD calls while waiting for a Call Back on a non-ACD IDN. While waiting for a Call Back, statistics on the ACD position show that the agent has been active on an IDN call.

Call Detail Recording

Call Detail Recording records are printed for a Called Party Control call after the controlling party disconnects. The recorded duration of the call includes the time spent waiting for Call Back. If Call Back is not received before the time-out period, or the controlling party does not disconnect, then the CDR record is generated when the trunk is locked out and the internal station idled. Called Party Control does not affect the originator or terminator field of the CDR record. Calls which cannot receive Call Back have CDR records printed when they go on-hook. The CDR record does not include the wait time for the disconnect signal from the Public Switched Telephone Network.

Call Modifications

Call Transfer or Conference may be applied to a Special Service call. However, Called Party Control is not supported on the post-transfer call. A Special Service call made from an SL-1, Meridian 1000 series, and digital set that is not held is disconnected when the station returns to the original call. If the party on the other DN disconnects, leaving the Special Service call on the Conference or Transfer key the only active call, Called Party Control is still not supported. For PBX stations, Called Party Control is not supported when a Special Service call is made with another party on hold. The Special Service call is disconnected when the PBX station returns to the held party. If the held party disconnects, Called Party Control is supported.

Call Waiting

An attendant cannot apply Call Waiting on an outgoing call that follows Called Party Control.

Camp-On

A local attendant cannot Camp-on a call to an analog (500/2500 type) set that is on an outgoing trunk call that follows Called Party Control.

Direct Inward System Access

If an external station is allowed access to the trunk on which a Special Service resides via Direct Inward System Access (DISA), the station may also access that Special Service. However, Called Party Control is not supported.

Electronic Switched Network

If a station on the Electronic Switched Network (ESN) is allowed to access the trunk on which a Special Service resides, the station can also access the Special Service. However, Called Party Control is not supported.

Trunk Calls

Called Party Control is only supported on trunks that are fully-supervised at both the far end and near end. Called Party Control is not supported on all types of calls involving more than one trunk, such as an ESN calling a Special Service.

Feature packaging

Called Party Control requires Operator Call Back China #1 (OPCB) package 126.

For digital trunks, the following package is required:

— 2 mbps Digital Trunk Interface (DTI2) package 129, which requires:

- International Supplementary Features (SUPP) package 131

Feature implementation

LD 16 – Respond to the CDPC (Called Party Control) prompt with YES or NO to specify whether or not to apply Called Party Control. The CDPC prompt appears after the SSDG (Special Service Digit) prompt. When dialed, the entered SSDG would enable Calling Party Control.

Feature operation

No specific operating procedures are required to use this feature.

Calling Party Control

Calling Party Control (CGPC) gives disconnect control to the originator of an answered trunk call, which has been extended by an external operator.

For incoming calls, if the calling party goes on-hook, the call is disconnected as normal. If the called party goes on-hook, the call is put on hold for a period of time designated in LD 16.

Operating parameters

Call Waiting is only supported on fully-supervised analog or 2 mbps digital DID/DOD trunks.

Call Waiting is only available on a route basis.

Call Waiting is not supported on tandem trunks.

Attendant Break-in is allowed on incoming Calling Party Control calls which are not toll calls.

Call Waiting is not allowed on an analog (500/2500 type) telephone which is on an incoming trunk call that follows a Calling Party Control call.

For outgoing calls, the calling party must be an ordinary station. For incoming calls, the disconnecting party must be an ordinary station.

Feature interactions

Attendant Barge-In
Busy Verify

A local attendant cannot barge into a trunk or busy-verify a trunk that is already established on a call to a station where Calling Party Control is to be applied.

Attendant Calls

Calling Party Control is not supported on calls when the called party is an attendant.

Automatic Call Distribution (ACD)

Calling Party Control is not supported on the ACD DN key.

Call Detail Recording

Call Detail Recording records are printed for a Calling Party Control call after the controlling party disconnects. The recorded duration of the call includes the time spent waiting for Call Back. If Call Back is not received before the time-out period, or the controlling party does not disconnect, then the CDR record is generated when the trunk is locked out and the internal station idled.

Call Waiting

Call Waiting is not allowed when the terminating party is already established on a call to a station where Calling Party Control is to be applied. An attendant cannot apply Call Waiting to an analog (500/2500 type) telephone that is on an incoming trunk call that follows Calling Party Control.

Camp-On

A local attendant cannot Camp-on calls to a station already established on a call to a station where Calling Party Control is to be applied. An attendant cannot Camp-on a call to an analog (500/2500 type) telephone that is on an incoming trunk call that follows Calling Party Control.

Direct Inward System Access (DISA)

If an external station is allowed access to the trunk on which a Special Service resides via DISA, the station may also access that Special Service. However, Calling Party Control is not supported.

Electronic Switched Network (ESN)

If a station on the ESN is allowed to access the trunk on which a Special Service resides, the station can also access the Special Service. However, Calling Party Control is not supported.

Trunk Calls

Calling Party Control is only supported on trunks that are fully-supervised at both the far end and near end. Calling Party Control is not supported on all types of calls involving more than one trunk, such as an ESN calling a Special Service.

Feature packaging

Calling Party Control requires Operator Call Back China #1 (OPCB) package 126.

For digital trunks, the following package is required:

— 2 mbps Digital Trunk Interface (DTI2) package 129, which requires:

- International Supplementary Features (SUPP) package 131

Feature implementation

LD 16 – Respond to the CGPC (Calling Party Control) prompt with YES or NO to specify whether or not to apply Calling Party Control to all incoming calls.

Feature operation

A Special Operator Signal, generated by the external operator, is expected to Call Back the originating station. During this period, a call cannot be made or received by the called party DN holding the call. If the called party goes off-hook, speechpath between the called party and trunk is re-established. A timer is applied to this period. If the called party does not go off-hook before time-out, the trunk is locked out. Calls can then be made or received on the DN.

For outgoing calls, if the called party goes on-hook, a disconnect signal is sent to the Private Branch Exchange. The Meridian 1 waits for the Outgoing Hold Timer to time out, and then disconnects the trunk and returns busy signal to the calling party. If the called party goes off-hook again, before the Outgoing Hold Timer times out, the call is reconnected. If the calling party goes on-hook, the trunk is disconnected.

Flexible Feature Codes

The Flexible Feature Code enhancement answers China's Ministry of Electronic Industry's requirement to access the following features from an analog (500/2500 type) telephone, using Flexible Feature Codes:

— Autodial

— Call Waiting

— Make Set Busy

— Multiple Wake-up.

Autodial

A user may define an Autodial DN that is automatically dialed by the Meridian 1 system, in one of two ways:

— in LD 10, while defining the Autodial DN length under the feature (FTR) ADL, or

— using the Autodial Activate (ATDA) FFC, defined in LD 57. This method requires that the length of the Autodial must first be defined in LD 10. The user goes off-hook and dials the ATDA FFC. Upon receiving dialtone, the user enters the desired Autodial DN, and then goes on-hook.

If, after going off-hook, no digits are entered within a customer-defined period of time (defined in LD 15) under ADLD (Auto Dial Delay), the Autodial DN is automatically dialed.

> ***Note:*** In overlay 10, the user may define a partial DN as an Autodial DN. The user may enter the remaining digits while making a call – the user goes off-hook, waits for the dial tone to time out, and then enters the remaining digits of the desired DN. The call is then dialed out.

To deactivate Autodial, the user dials either the Autodial Deactivate (ATDD) FFC (defined in LD 57) or the general Deactivate (DEAF) FFC (also defined in LD 57).

Call Waiting

A user may activate Call Waiting from an analog (500/2500 type) telephone with Call Wait Class of Service, by dialing the Call Waiting Activate (CWGA) FFC (defined in LD 57). To deactivate Call Waiting, the user dials either the Call Waiting Deactivate (CWGD) FFC (defined in LD 57), or the general Deactivate (DEAF) FFC (also defined in LD 57).

If Call Waiting is deactivated using FFCs, then station-to-station call waiting is also deactivated at the set.

If Class of Service (COS) is CWA, then ACTIV or DEACT will be printed in brackets when CWT is activated or deactivated.

The CWT FFCs do not affect Precedence Call Waiting.

Make Set Busy

A user may activate Make Set Busy from an analog (500/2500 type) telephone by dialing the Make Set Busy Activate (MSBA) FFC (defined in LD 57). To deactivate Make Set Busy, the user dials the Make Set Busy Deactivate (MSBD) FFC (defined in LD 57), or the general Deactivate (DEAF) FFC (also defined in LD 57).

Multiple Wake-up

Multiple Wake-up allows up to four wake-up calls to be entered using a FFC, and allows those calls to be repeated daily, if desired, by entering a separate FFC. The time is in a four-digit 24-hour format (H1 H2 M1 M2). To activate Repeat Multiple Wake-up, the user dials "MWRA H1 H2 M1 M2".

If a wake-up time has already been entered using the standard Automatic Wake-up Activate (AWUA) FFC, then only three other multiple wake-up times may be entered.

To deactivate a single wake-up time, the user enters "MWUD H1 H2 M1 M2", where MWUD is the Multiple Wake-up Deactivate FFC. To deactivate all wake-up times, the user enters "MWUD#".

The general Deactivate (DEAF) FFC does not apply to Multiple Wake-up.

If the MWUD FFC is entered again after all wake-up times have been deactivated, confirmation tone is given. If the MWUD FFC is entered again to deactivate a wake-up time that has been already deactivated, overflow tone is given. If an attempt is made to enter an existing wake-up time, confirmation tone is give. If an attempt is made to enter an existing wake-up time as a repeat wake-up time, then that time is activated as a repeat wake-up time. If an attempt is made to enter an existing repeat wake-up time as a single wake-up time, then that time is activated as a single wake-up time. In both cases, confirmation tone is given.

To verify a Multiple Wake-Up time, the user dials "AWUV H1 H2 M1 M2" (where AWUV is the existing Verify Automatic Wake-up FFC).

Operating parameters

The FFCs selected must be unique numbers up to seven digits long. They cannot conflict with any DN already in the dialing plan.

The FFC functionality is not supported on the A, B, C, or D button of the 16-button DTMF set. The new FFC functions may be used, however, by manually dialing the appropriate FFC.

The following are not supported:

— the attendant query for the Multiple Wake-up time

— Multiple Wake-up from attendant administration

— the Background Terminal, Background Terminal Display for Multiple Wake-up

— Traffic for Multiple Wake-up

Feature interactions

The same feature interactions apply as for the Make Set Busy and Call Waiting features.

Automatic Wake-up

The Automatic Wake-up feature may be active the same time as Multiple Wake-up.

Dial Intercom Group

The FFC feature and the Dial Intercom Group feature are mutually exclusive.

Hotline

Flexible Hotline and/or Enhanced Hotline are mutually exclusive with the Autodial FFC functionality.

Feature packaging

Flexible Feature Codes (FFC) package number 139 is required. The following packages are also required:

— Optional Features (OPTF) package 1, for the Autodial FFC

— Make Set Busy (MSB) package 17

— Automatic Wake-up (AWU) package 102

— Background Terminal (BGD) package 99

Feature implementation

LD 15 – Define the Autodial time delay (the number of seconds that the user is allowed, while off-hook, to enter DN digits before the Autodial DN is automatically dialed), by responding to the ADLD prompt with a value between 0 -20, in two-second intervals. If a default value of 0 seconds is entered, Autodial is inhibited. The ADLD time must be greater than the DIND/DIDT time designed for analog (500/2500 type) telephones.

LD 10 – In response to the FTR prompt, define the number of digits in the Autodial DN, and enter the Autodial DN if desired.

LD 57 – Respond to the following prompts to define DNs to be used as FFCs (up to seven digits):

- ATDAAutodial activate
- ATDDAutodial deactivate
- CWGACall Waiting activate
- CWGDCall Waiting deactivate
- DEAFDeactivate all FFCs
- MSBAMake Set Busy activate
- MSBDMake Set Busy deactivate
- MWUAMultiple Wake-up activate
- MWRARepeat Multiple Wake-up activate
- MWUDMultiple Wake-up deactivated

Note: The same FFC may be programmed to both activate and deactivate any of the features described above.

Feature operation

From an analog (500/2500 type) telephone, enter the appropriate FFC listed above to activate or deactivate Autodial, Call Waiting, Make Set Busy, or Multiple Wake-up.

Flexible Timers

The Digit Pause Timer provides customer-defined parameters to control the following time-outs:

— The dial tone timeout, after the set has been placed off-hook and no digits dialed. After timeout, the set is placed in line lockout.

— The inter-digit pause timeout, between the first and second digits.

— The inter-digit pause timeout, after the second digit.

The Delayed Answer Timer provides a customer-defined timeout to control the period that a set remains ringing before it is answered. If timeout occurs, the ringing and ringback stop, and the call is disconnected.

Operating parameters

Flexible Timers are only supported on fully-supervised analog or 2 Mbps digital DID/DOD trunks

Flexible Timers are only available on a route basis.

Feature packaging

Flexible Timers require Operator Call Back (OPCB) package 126.

For digital trunks, the following package is required:

— 2 mbps Digital Trunk Interface (DTI2) package 129, which is dependent upon:

- Supplementary Features (SUPP) package 131

Feature implementation

LD 15 – Respond to DPTO with the digit pause time-outs in seconds. Respond to DLAT with a value, between 0 and 120, for the delayed answer timer for internal calls. (A value of 0 turns off the timer; there is no time limit.) Respond to MWDC with YES, to leave Multi-Wake Up active until deactivated using an FFC, or with NO to allow deactivation as with Automatic Wake Up. Respond to AUDD with a value, from 0 to 7, setting the auto dial delay, in seconds. (If 0 is specified, auto delay dial will not take place.)

Feature operation

No specific operating procedures are required to use this feature.

KE Multifrequency Compelled Tandem Signaling

This feature causes the Meridian 1 to send an H MFC Level 1 forward signal to the CO, to indicate that a call is to be tandemed through it to the next CO. The H signal is sent immediately before the called party number is sent.

Note: If the CO is a DMS-100, the H signal is not sent.

Operating parameters

Only supported on fully-supervised analog or 2 Mbps digital DID/DOD trunks

It is only available on a route basis.

The MFC KE H signal is not included in the CDR record.

Feature packaging

KE Multifrequency Compelled Tandem Signaling requires Operator Call Back (OPCB) package 126

For digital trunks, the following package is required:

— 2 mbps Digital Trunk Interface (DTI2) package 129, which is dependent upon:

- Supplementary Features (SUPP) package 131
- Multifrequency Compelled Signaling (MFC) package number 128

Feature implementation

LD 18 – Respond to the TNDM N prompt with YES, to allow transmission of the MFC H signal, or NO to prevent such transmission.

LD 94 – Define the HTDM (H Tandem signal) under forward Level 1 signaling.

Feature operation

No specific operating procedures are required to use this feature.

Malicious Call Trace Enhancement

With this enhancement, a Meridian 1 can have Called Party Control on incoming calls when the Malicious Call Trace (MCT) feature is activated from a station, or when the Multifrequency Compelled (MFC) Idle Call Trace (IDCT) signal is sent. If the MFC calling number identification digits are available from the calling party, they will appear in the printing of the MCT records.

An outgoing call will become a Called Party Control call when the MFC IDCT signal is received.

Operating parameters

This feature is only supported on fully-supervised analog or 2 mbps digital DID/DOD trunks.

It is only available on a route basis.

For this feature to operate, the MCT feature and the Operator Call Back package must be equipped.

Feature packaging

Malicious Call Trace Enhancement requires Operator Call Back China #1 (OPCB) package 126.

For digital trunks, the following package is required:

— 2 mbps Digital Trunk Interface (DTI2) package 129, which is dependent upon:

- International Supplementary Features (SUPP) package 131
- Malicious Call Trace (MCT) package 107

Feature implementation

LD 16 – Create or modify data for trunk routes.

Prompt	Response	Description
REQ	NEW CHG	Add new data. Change existing data.
TYPE	RDB	Route Data Block.
...		
CDPC	(NO), YES	Calling Party Control is (is not) enabled when MCT feature is activated on incoming calls on this route enabled (not enabled). Prompted when OPCB = YES.
ALRM	(NO), YES	Alarm is (is not) to sound on an incoming call when the MCT feature is activated.
CDCT	(NO), YES	Called Party Control is (is not) enabled on incoming calls when MFC IDCT signal is sent. Prompted when OPCB = YES.
CGPC	(NO), YES	Calling party control on incoming calls on this route enabled (not enabled). Prompted when CNTL = YES and OPCD = YES.

LD 18 – Create or modify the Special Service digits that the route uses to determine if the call is a Special Service:

Prompt	Response	Description
REQ	NEW CHG	Add new data. Change existing data.
TYPE	SSL	Special Service List data block.
SSL	1-15	Special Service List number.
SSDG	0-9999	1 to 4 digit Special Service number.
CDPC	(NO), YES	Called Party Control is (is not) enabled.
TOLL	(NO), YES	The SSDG entry is (is not) a toll number.
ALRM	(NO), YES	Alarm is (is not) enabled.

Note: The SSDG, followed by CDPC, TOLL and ALRM prompts reappear after each ALRM prompt until the list contains 100 entries or a <CR> is entered for SSDG.

Feature operation

No specific operating procedures are required to use this feature.

Off-hook Tone

A new tone, called the howler tone, is used to signal an analog (500/2500 type) telephone that it is off-hook. This tone is activated manually by the attendant. To supply howler tone to a telephone in line lockout, the attendant breaks in on the telephone. If the locked-out telephone is on the source side, the attendant presses the Signal Source key, followed by either the Release key (when there is no destination party) or the Release Source key. If the locked-out telephone is on the destination side, the attendant presses the Signal Destination key followed by the Release Destination key. The locked-out telephone then receives howler tone.

Operating parameters

The Off-hook Tone feature is only supported on fully-supervised analog or 2 mbps digital DID/DOD trunks.

The Off-hook Tone is only available on a route basis.

Any release operation at the Attendant Console that would cause the source and destination sides to be connected will not turn on the howler tone.

Once the howler tone is activated, it continues until either the telephone goes on-hook, or the howler tone timer times out.

Calls cannot be Camped-on or Call Waited to a station which is in line lockout or receiving howler tone.

A Break-in attempt on a station receiving howler tone is given temporarily denied treatment.

Feature packaging

Off-hook Tone requires Operator Call Back China #1 (OPCB) package 126.

For digital trunks, the following package is required:

— 2 mbps Digital Trunk Interface (DTI2) package 129, which is dependent upon:

- Multifrequency Compelled Signaling (MFC) package 128
- International Supplementary Features (SUPP) package 131
- Attendant Break-in/Trunk Offer (BKI) package 127

Feature implementation

LD 56 – Modify or change customer's tone and ringing parameters.

Prompt	Response	Description
REQ	NEW CHG	Add new data. Change existing data.
TYPE	FTC	Flexible Tones and Cadences data block.
...		
HOWL	i bb cc tt	Howler tone in decimal. The default is overflow tone. TDS external, burst, cadence, m and tone. The default is 0017.
...		

LD 15 – Modify or change customer's data blocks.

Prompt	Response	Description
REQ	NEW CHG	Add new data. Change existing data.
TYPE	CDB FTR	Customer Data Block. Release 21 gate opener.
...		
- ALDN	xxxx	Alarm Directory Number.
TYPE	TYIM	Release 21 gate opener.
...		
- HWTT	0-(300)-600	Length of howler tone in seconds (0 = continuous tone).

Feature operation

No specific operating procedures are required to use this feature.

Toll Call Identification

Generally, outgoing toll calls can be identified by using the existing NATL or TDG prompts in LD 16. However, Toll Call Identification is provided for routes having MFC Signaling by using the TOLL prompt in LD 18. This is assigned to Special Service numbers to be marked as toll call within a Special Service List (SSL) within LD 18 and assigned to the route in LD 16.

Operating parameters

Toll Call Identification is only supported on fully-supervised analog or 2 mbps digital DID/DOD trunks.

Toll Call Identification is only available on a route basis.

Feature interactions

There are no interactions with other features.

Feature packaging

Toll Call Identification requires Operator Call Back China #1 (OPCB) package 126.

For digital trunks, the following package is required:

— 2 mbps Digital Trunk Interface (DTI2) package 129, which is dependent upon:

- International Supplementary Features (SUPP) package 131

Feature implementation

LD 16 – Create or modify data for trunk routes.

Prompt	Response	Description
REQ	NEW CHG	Add new data. Change existing data.
TYPE	RDB	Route Data Block.
...		
TKTP	TIE SEMI TIE AUTO TIE TONE	Semi-automatic TIE trunk data block. Automatic TIE trunk data block. Tone TIE trunk data block.

LD 18 – Create or modify data for the 16-Button DTMF operation.

Prompt	Response	Description
REQ	NEW CHG	Add new data. Change existing data.
TYPE	SSL	Special Service List data block.
...		
SSDG	nnnn	1-4 digit Special Service number.
TOLL	(NO), YES	The SSDG entry is (is not) a toll number.

Feature operation

No specific operating procedures are required to use this feature.

Toll Operator Call Back

The Toll Operator Call Back feature allows a station on an established ingoing or outgoing trunk call extended by an external operator to be put on hold for a pre-defined length of time, by going on-hook. Later, the external operator can ring this station by sending a Special Operator Signal to the station, rather than having to redial.

The station is put on hold only if the far-end has control of the call. It is kept on hold for a pre-defined length of time, depending on the call type. During this period of hold, the speechpath between the station and trunk is not idled. If the station goes off-hook, the speechpath is reestablished. If the Special Operator Signal is received while the station is on hold, the station is rerung. If the hold period times out, the held station is idled.

On fully-supervised DID and DOD trunks, the Meridian 1 system checks whether the call is a regular call or a Special Service call. Examples of Special Services are time-of-day announcements, the police department, and the fire department. There may be several Special Services located in a Public Switched Telephone Network. In most countries, a reserved first digit is used to access the Special Service. This digit is called the Special Service Digit and distinguishes regular calls from Special Service calls on DID and DOD trunks. If the first digit outpulsed to the Public Switched Telephone Network is a Special Service Digit, then the call is interpreted as being a Special Services call. These Special Service calls must begin with the "SSDG" digit or digits.

The Public Switched Telephone Network must be able to handle this special signaling requirement.

The Call Back feature is used by the Called Party Control, Calling Party Control, and Toll Operator Break-in features as follows:

— for Called Party Control/Calling Party Control, when a Private Branch Exchange station is established on an answered outgoing fully-supervised DOD/DID trunk Special Service call. The Private Branch Exchange expects to receive the Special Operator Signal when the station goes on-hook and is put on hold for Call Back.

— for Toll Operator Break-in, after Break-in has been performed on a station, the Calling Party feature is activated when the station goes on-hook. The station is put on hold and the Private Branch Exchange expects to receive the Special Operator Signal for Call Back.

Operating parameters

The Toll Operator Call Back feature is only supported on fully-supervised analog or 2 mbps digital DID/DOD trunks.

The Toll Operator Call Back feature is only available on a route basis.

While waiting for the Special Operator Signal on one DN, calls may be made or received on another DN.

Calls cannot be made or received on an analog (500/2500 type) telephone while the set is on hold waiting for the Special Operator Signal.

A station cannot receive a Call Back while being held for a Special Operator Signal for another Call Back.

A locked-out trunk expecting a Special Operator Signal is sent overflow tone.

For supervised trunks, the Meridian 1 Private Branch Exchange assumes that all Special Service calls require the Special Operator Signal to Call Back a station.

There is no restriction to the number of times that any station may receive Call Back.

Feature packaging

Toll Operator Call Back requires Operator Call Back China #1 (OPCB) package 126.

For digital trunks, the following package is required:

— 2 mbps Digital Trunk Interface (DTI2) package 129, which is dependent upon:

- International Supplementary Features (SUPP) package 131

Feature implementation

LD 16 – Respond to the OPCB (Operator Call Back) prompt with YES or NO, to enable or disable Operator Call Back.

LD 73 – Respond to the SOSI (Special Operator Signal Internal) prompt when creating incoming call signals, with A, B, C, or D. The default value is N (undefined). The SOSI prompt will appear after the CLRF prompt only if the OPCB package is equipped and the OPCA prompt is undefined. Respond to the SOSO (Special Operator Signal Outgoing) prompt when creating outgoing call signals, with A, B, C, or D. The default value is N (undefined). The SOSI prompt will appear after the CLRF prompt only if the OPRC package is equipped and the OPCA prompt is undefined.

Feature operation

The operator presses the **Call Back** key on the console to send the Special Operator Signal. This signal persists as long as the key remains pressed. The attendant can control the ringing cadence of the station receiving Call Back. This configuration is possible only on 2 mbps Digital DID/DOD trunks.

Toll Operator Call Back Enhancement

This enhancement provides the ability to Call Wait or Camp-on to some Calling Party Control and Called Party Control calls on 2 mbps digital DID or DOD trunks.

Operating parameters

The Toll Operator Call Back enhancement is only supported on fully-supervised analog or 2 mbps digital DID/DOD trunks.

The Toll Operator Call Back enhancement is only available on a route basis.

Feature packaging

Toll Operator Call Back Enhancement requires Operator Call Back China #1 (OPCB) package 126.

For digital trunks, the following package is required:

— 2 mbps Digital Trunk Interface (DTI2) package 129, which is dependent upon:

- International Supplementary Features (SUPP) package 131

Feature implementation

LD 16 – Create or modify data for trunk routes:

Prompt	Response	Description
REQ	NEW CHG	Add new data. Change existing data.
TYPE	RDB	Route Data Block.
...		
OPCB	(NO), YES	Turn on (off) detection of Operator Call Back Signal (a NO response also removes SSDG data).

Feature operation

This enhancement also provides operator control of ringing cadences used in Toll Operator Call Back. When a telephone is rung in a call back from an external operator, it is rung continuously without cadence. Only when the operator releases the call back key does the station begin ringing with the normal (internal) cadence.

Toll Operator Break-in

The Toll Operator Break-in (TOBI) feature allows a toll operator to break-in to and extend a toll call to a busy station, and also to Call Back the station without having to redial it.

Operating parameters

Toll Operator Break-in is only supported on fully-supervised analog or 2 mbps digital DID/DOD trunks.

Toll Operator Break-in is only available on a route basis.

Toll Operator Break-in is only available on MFC trunks.

Call modification is not allowed during a Toll Operator Break-in conference.

Feature interactions

Attendant Barge-in
Busy Verify

A local attendant cannot barge into a trunk or busy-verify a trunk that is already established on a Toll Operator Break-in conference.

Attendant Break-in

Local Attendant Break-in is temporarily denied if the party to whom the call is being extended is already on a Toll Operator Break-in conference established on a trunk call where Calling Party Control is to be applied, or awaiting the Special Operator Signal. Attendant Break-in is not allowed on outgoing Called Party Control calls.

Attendant Calls

Toll Operator Break-in is denied if the party to whom the call is being extended is on an established connection to an attendant.

Automatic Call Distribution (ACD)

Toll Operator Break-in is not supported on the ACD DN key. Toll Operator Break-in is allowed on a non-ACD DN key of an ACD position.

Camp-On

Toll Operator Break-in is not allowed on calls where the party to whom the call is being extended already has a camped-on call, nor if the party is already connected to a camped-on call in the Meridian 1 system. A local attendant cannot camp calls to either party involved in a break-in while the parties are established on a Toll Operator Break-in conference. A local attendant cannot camp calls to a station already established on a call to a Special Service or toll operator, or already established on a call with a station awaiting Call Back.

Call Detail Recording

Call Detail Recording (CDR) records are printed for a Toll Operator Break-in call after the controlling party disconnects. The recorded duration of the call includes the time spent waiting for Call Back. If Call Back is not received before the time-out period, or the controlling party does not disconnect, then the CDR record is generated when the trunk is locked out and the internal station idled. Calls which cannot receive Call Back have CDR records printed when they go on-hook. The CDR record does not include the wait time for the disconnect signal from the Public Switched Telephone Network.

Call Forward All Calls

Call Forward All Calls takes precedence over Toll Operator Break-in. Call Back takes precedence over Call Forward All Calls. Internal stations may Call Forward All Calls to a Special Service.

Call Forward Busy

Toll Operator Break-in takes precedence over Call Forward Busy. Call Forward Busy is applied to new incoming DID calls if the called party is awaiting Call Back.

Call Forward No Answer

Call Forward No Answer can be applied to Toll Operator Break-in calls to an idle station. Once Call Forward No Answer has been applied, Call Back is no longer supported on the call unless the Calling Party Control feature is enabled on that route.

Call Modifications

No call modifications are allowed during a Break-in conference.

Call Park

Toll Operator Break-in is not allowed when the party to whom the call is being extended is parked, or is recalling a parked call.

Call Waiting

Call Waiting is not allowed when the terminating party is either of the Break-in parties, already established on a call to a Special Service, or already established on a call with a station awaiting Call Back. Toll Operator Break-in is not allowed on calls where the party to whom the call is being extended already has a call waiting, or is call waiting within the Meridian 1 system.

Centralized Attendant Service (CAS)

Toll Operator Break-in is not allowed on calls involving a Centralized Attendant Service attendant or RLT trunk. A CAS attendant that has access to a trunk on which a Special Service exists may also access that Special Service. However, Call Back is not supported.

Digit Display

The digit display on an SL-1, Meridian 1000 series, and digital set is blank when its user is on a Toll Operator Break-in conference, or is waiting for Call Back. When the Call Back is answered, the display shows the route access code and the trunk member number. For Special Service calls, the dialed digits are shown. If a Special Service call is call-modified, the route access code and member number are displayed when reconnected to the Special Service.

Digital Trunks

Toll Operator Break-in and Call Back are not supported on 1.5 mbps digital trunks.

Electronic Switched Network (ESN)

Toll Operator Break-in is allowed on calls where the party broken into is on an ESN trunk with warning tone allowed Class of Service. Toll Operator Break-in is not allowed on calls where the party to whom the call is being extended is at the far end of an ESN trunk. If a station on the ESN is allowed to access the trunk on which a Special Service resides, the station can also access the Special Service.

Hunting

Hunting may be applied on non-DID calls if the called party is on-hook waiting for Call Back.

Multifrequency Compelled Signaling (MFC) Interworking with Application Module Link (AML) Based Applications

The Toll Operator Break-In feature is activated after the MFC Level II processing forward signal TOLL OPERATOR BREAK-IN has been received prior to termination on a station busy on a non-toll call for which break-in is allowed. The Level II MFC backward signal that is returned is BUSY, BREAK-IN IS ALLOWED, instead of the standard STATION BUSY. This feature is supported if CCR routes such an incoming R2MFC call to a busy station.

However, if CCR gives the FORCE BUSY treatment to the call, the signal returned is BUSY, BREAK-IN IS NOT ALLOWED, since in this case there is no call in which to break-in. This is also true if the call terminates on a CDN in default mode and is given busy treatment, because the maximum number of calls in the default ACD queue via this CDN has already been reached.

Multiple Appearance DNs (multiple-call arrangement)

Toll Operator Break-in is only allowed on multiple-call Multiple Appearance DNs when all appearances of the DN are busy. The Break-in occurs on the last least-restricted station of the DN's appearance. Only the appearance that is expecting Call Back is rung. Other appearances may still receive or make calls during the wait period.

Multiple Appearance DNs (single-call arrangement)

Toll Operator Break-in is allowed on single-call Multiple Appearance DNs when at least one appearance of the DN is busy. If only one appearance is busy, that appearance is broken into. If more than one appearance is busy, all the busy DNs are broken into. Call Back occurs only when all appearances are on-hook. Other appearances are not included in the break-in conference when one of the appearances is in a break-in conference. If one appearance is expecting Call Back, the other appearances cannot make or receive calls. If one appearance is expecting Call Back and another appearance goes off hook, the appearance that is off-hook becomes connected to the DID/DOD trunk, and is considered to be the last station connected to the Public Switched Telephone Network. It is only this station that receives the Call Back signal. The lamps on the other appearances flash but the appearances are not rung.

Override

Meridian 1 proprietary telephone users cannot override stations awaiting Call Back, that have received the backward MFC Break-in signal but not the Special Operator Signal, or that are established on a call that may require Call Back.

Pulsed E&M DTI Signaling

Cancel Offering (Toll Operator Break Out) is added to the Toll Operator Break-in feature. Calling Party Control is enhanced to use the OHTT, as well as the OHT prompt in LD 16.

Ring Again

A user at an internal station may apply ring again on any one of the parties established in a Toll Operator Break-in conference, including the DID trunk. Ring Again may be applied to stations which are established on a Special Service or toll operator call, are established on a Special Service or toll operator call at the far end and established on a call to an internal station, or are waiting for or about to receive Call Back.

Trunk Calls

Toll Operator Break-in is only supported on trunks that are fully-supervised at both the far end and near end.

Feature packaging

Toll Operator Break-in requires the following packages:

— International Supplementary Features (SUPP) package 131

— Attendant Break-in/Trunk Offer (BKI) package 127

For digital trunks, the following package is required:

— 2 Mbps Digital Trunk Interface (DTI2) package 129, which is dependent upon:

- Operator Call Back China #1 (OPCB) package 126

Feature implementation

LD 16 – Create or modify data for trunk routes.

Prompt	Response	Description
REQ	NEW CHG	Add new data. Change existing data.
TYPE	RDB	Route Data Block.
...		
TKTP	DID	Direct Inward Dialing trunk.
...		
MFC	YES	MFC Route.

LD 94 – Implement an MFE signal Table.

Prompt	Response	Description
REQ	NEW CHG	Add new data. Change existing data.
TYPE	R2MF	To implement MFC or MFE table and to provide for TOBI.

Feature operation

The status of the party to be broken into determines the call termination treatment. If the party is idle, the station is rung and the call is extended. If the party is busy, and Toll Operator Break-in is denied, a level two backward BUBN (Busy, Toll Operator Break-in Not Allowed) signal is returned to the operator.

If Toll Operator Break-in is allowed, a level two backward BUBA (Busy, Toll Operator Break-in Allowed) signal is returned to the toll operator. Upon Break-in, the toll operator, the party whose call is being broken into, and the party to whom the call is being extended become connected in a three-party conference. The intrusion tone is given, at periodic intervals, to the conference parties.

If the party broken into goes on-hook, the operator and the party to whom the call is being extended remain connected in a simple call. Intrusion tone is removed. The operator can then extend the call.

If the party to whom the call is to be extended goes on-hook, the conference is canceled, intrusion tone is removed, and the party broken into is idled. If there were more than one party in the conference, the remaining parties become reconnected.

Immediate Call Back

If the Immediate Call Back option is equipped, the party to whom the call is to be extended is rung immediately upon going on-hook. No Special Operator Signal is sent. If this option is not equipped, the party is put on hold, and is rung when the Special Operator Signal is sent. If the call is extended to a PBX station, the station must be equipped with the Permanent Hold feature.

If neither party goes on-hook, the operator may still extend the call. In this case, the party being extended replaces the operator in the Break-in conference, with intrusion tone still being given to the conference parties.

Force Release

If equipped, the Force Release option allows the toll operator to break-in to a call, without giving intrusion tone, and establish a simple call with the party to whom the call is to be extended. The other parties, meanwhile, remain connected to each other, if restrictions allow.

Force Release is ignored if more than one party in the Break-in conference is a multiple appearance of the party to whom the call is to be extended.

If the party to whom the call is to be extended refuses to accept the call extension, and the toll operator goes on-hook, the Break-in conference is canceled, intrusion tone is removed, and the established parties remain in a simple call.

Vacant Number Announcement

A vacant number announcement treatment is given to a caller that has dialed a vacant number (MFVN treatment), a vacant office (MFVO), or has encountered congestion (MFCG treatment) after dialing.

Operating parameters

Vacant Number Announcement is only supported on fully-supervised analog or 2 mbps digital DID/DOD trunks.

Vacant Number Announcement is only available on a route basis.

Feature interactions

Vacant Number Announcement does not interact with other features.

Feature packaging

Vacant Number Announcement requires the following packages:

— Operator Call Back China #1 (OPCB) package 126

— Multifrequency Compelled Signaling (MFC) package 128

For digital trunks, the following package is required:

— 2 Mbps Digital Trunk Interface (DTI2) package 129, which is dependent upon:

- International Supplementary Features (SUPP) package 131

Feature implementation

LD 15 – Create or Modify customer data block, to add MFC LEVEL 1 "VACO" signal, MFC LEVEL 2 "VACC" signal, and MFC LEVEL 1 and 2 "CONG" signal.

The following prompts appear only if the MFC package 128 is equipped.

Prompt	Response	Description
REQ	NEW CHG	Add new data. Change existing data.
TYPE	CDB INT	Customer Data Block. Release 21 gate opener.
...		
- MFVO	(OVF, OVF, OVF, ATN), OVF, ATN, RAN, NAP, BSY, SRC1-8	MFC call to a Vacant Office, four entries are required.
- - RANR	0-30, 32-127	RAN route number
- MFVN	(OVF, OVF, OVF, ATN), OVF, ATN, RAN, NAP, BSY, SRC1-8	MFC call to a Vacant Number, four entries required.
- - RANR	0-30, 32-127	RAN route number.
- MFCG	(OVF, OVF, OVF, ATN), OVF, ATN, RAN, NAP, BSY, SRC1-8	MFC congestion, four entries required.
- - RANR	0-30, 32-127	RAN route number.

Feature operation

No specific operating procedures are required to use this feature.

China Number 1 Signaling Enhancements

The enhancements make up the following treatments:

— Greater flexibility is given the system to allow delayed outpulsing of digits on an outgoing Central (CO) or Direct Outward Dialing (DOD) trunk. This will ensure, when necessary, that long intervals are not left between outpulsed digits. (The PSTN may require only short intervals between outpulsed digits.)

— The Meridian 1 will allow a request for Call Number Identification only if the incoming trunk has CNA Class of Service, and the dialed station has MCTA Class of Service. (Prior to this enhancement, only CNA trunk Class of Service was needed.)

— Busy Tone to Calling Party tone can be given to the last party for Calling Party Control and Called Party Control connections, upon the release of the first party.

Operating parameters

There are no operating parameters for this feature.

Feature interactions

Delay Digit Outpulsing will be denied when dialing is done by way of any of the following functions:

— autodial

— last number redial

— speed call

— store number redial

Feature packaging

China Number 1 Signaling Enhancements requires International Supplementary Features (SUPP) package 131.

Feature implementation

LD 16 – Respond to the DDO prompt with YES to enable or NO to disable the delay digits outpulsed option.

Prompt	Response	Description
REQ	NEW CHG	Add new data. Change existing data.
TYPE	RDB	Route Data Block.
...		
DDO	(NO), YES	(Disable) enable the Delay Digits Outpulsing for DOD and CO trunks. The DDO prompt will appear only if the SUPP package 131 is equipped, and ICOG = OGT or IAO.

LD 16 – Also respond to the CNIT prompt with YES to enable or NO to disable the Calling Number Identification option.

Prompt	Response	Description
REQ	NEW CHG	Add new data. Change existing data.
TYPE	RDB	Route Data Block.
...		
CNIT	(NO), YES	(Disable) enable Call Number Identification Trace. Request MFC Call Number Identification digits only if the dialed station has MCTA Class of Service. Prompted when the following occur: MCT and MFC packages are equipped TKTP = DID or TIE MFC = R2MF, and An MFC signaling table has been defined on the route.

Feature operation

No specific operating procedures are required to use this feature.

CIS Multifrequency Shuttle

The CIS Multifrequency Shuttle (CIS MF Shuttle) feature provides the existing Commonwealth of Independent States (CIS) Digital Trunk Interface with the ability to handle the Multifrequency Shuttle signaling protocol.

Prior to X11 Release 23, the two CIS-specific Digital Trunk Interface cards, the NTCG01AA (CDTI2) for Meridian 1 Options 51-81C and the NTCG02AA (CSDTI2) for Options 11E and 11C, met the CIS DTI2 signaling requirements and supported Dial Pulse signaling. The NTCG01/02AA are described in the *Intelligent Peripheral Equipment Circuit Cards for CIS* document. CIS MF Shuttle uses a combination of two out of six tones for Multifrequency Signaling between exchange connections. With CIS MF Shuttle, call setup time is reduced as a result of its faster transmission speed.

CIS MF Shuttle signaling is supported on two DTI cards: the NTCG01AB (CDTI2) and the NTCG02AB (CSDTI2). These cards are fully backward compatible with the X11 Release 21 CIS Digital Trunk Interface feature and can be used with Release 21 software with the same functionality as the NTCG01AA and the NTCG02AA cards.

CIS MF Shuttle supports the following common features:

— Multifrequency Shuttle signaling

— Buffered Dial Pulse signaling outpulsing performed by card firmware

— Dial Pulse signaling digit collection performed by card firmware

— Downloadable Dial Pulse speed and Make/Break ratio

— Cyclic Redundancy Check (CRC) multiframe format (allowed optionally)

— A-law/μ-law conversion

- Periodic Pulse Metering (PPM) when working in non-CIS mode
- Continuous Pulsing Detection (CPD) when working in non-CIS mode
- Expansion of the call types recognition mechanism based on the Special Service List (SSL) with the addition of a new call type - Special Service Unanswered Calls
- Man Machine Interface (MMI) port for debugging
- CIS digital trunks signaling (outgoing, incoming toll, and incoming local calls)
- Automatic Number Information (ANI) transmission on request from the Central Office (CO)
- Dial Tone to the calling party, after the Meridian 1 seizes an outgoing CIS trunk
- Special disconnect procedure (two-way release) providing Malicious Call Trace in CIS telephone network
- Unanswered free special service calls
- CIS transmission plan
- Downloading of the required firmware mode per loop-limited ordinary DTI2 or CIS DTI2

Sending and receiving digits

In order to meet the needs of CIS MF Shuttle signaling, two new SSL tables have been created: the ENBLOCK SSL table and the Flexible DN Size SSL table. These tables are implemented separately. When the outgoing trunk is idle, CIS MF Shuttle uses the ENBLOCK SSL table for ENBLOCK dialing. For incoming calls, the Flexible DN Size SSL table is used. The total number of SSL tables in the system has increased to 31 with the CIS MF Shuttle feature.

For outgoing CIS MF Shuttle trunks, the ENBLOCK Special Service List (SSL) table, in Overlay 18, is used to collect digits for optimal dialing operation. The ENBLOCK SSL table uses the number of digits dialed to determine the End of Dialing situation. It is recommended that **all** the possible numbers that can be dialed through the outgoing CIS MF Shuttle trunk be defined in the ENBLOCK SSL table. If an extra digit is dialed that has not been defined, the CIS MF Shuttle protocol considers the call a failure. Outgoing toll calls should be defined in the SSL table in Overlay 18 at the TOLL prompt. ENBLOCK signaling for outgoing toll calls remains active until all the toll access digits are dialed. The Special Service Digits combination (SSDG) field of the ENBLOCK SSL table should **not** include the outgoing CIS MF Shuttle trunk access code.

Table 7 provides an example of DN groups which may be included in a CIS CO dialing plan.

Table 7
Example of DN groups

DN Format	DN Length	DN Type
77XXXX	6	regular
95XXXXX	7	regular
6XXXXXX	7	regular
01	2	SSUC (Special Service Unanswered Call)
02	2	SSUC
03	2	SSUC
8...	1	Toll access code digit
Note: X represents any digit.		

Table 8 provides an example of the ENBLOCK SSL table for the outgoing CIS MF Shuttle route that would be defined based on the sample DNs described in Table 1. ENBLOCK SSL tables are defined in Overlay 18.

Table 8
Example of ENBLOCK SSL table

SSDG	**77**	**95**	**6**	**01**	**02**	**03**	**8**
CPDC	NO	NO	NO	NO	NO	NO	NO
TOLL	NO	NO	NO	NO	NO	NO	**YES**
ALRM	NO	NO	NO	NO	NO	NO	NO
TNDM	NO	NO	NO	NO	NO	NO	NO
SSUC	NO	NO	NO	YES	YES	YES	NO
NDGT	**6**	**7**	**7**	**2**	**2**	**7**	**1**

For incoming CIS MF Shuttle trunks, the DN size is defined as either fixed or flexible. The DN size is an important aspect of CIS MF Shuttle configuration because it determines the number of digits that are expected from the CIS CO for incoming CIS MF Shuttle routes. Therefore, entering the DN size is obligatory for all calls which originate from an incoming CIS MF Shuttle trunk. When the number of digits expected from the CIS CO is constant, and does not vary between different call types, then the DN size for the incoming CIS MF Shuttle route is fixed. Fixed DN size is defined at the DN Size DNSZ prompt in Overlay 16. For example, if it is known that for each incoming CIS MF Shuttle call the CIS CO dials four digits, then the fixed DN size would be defined as four at the DNSZ prompt in Overlay 16.

When the number of digits expected from the CIS CO varies from call to call, the DN size for the incoming CIS MF Shuttle route is flexible. If this is the case, it is necessary to define a separate DN size for each tandem direction. As introduced with the CIS MF Shuttle feature, flexible DN size is defined in relation to a DN prefix of up to four digits of the DN dialed by the CIS CO. Flexible DNs are defined using the Flexible DN size SSL table in Overlay 18. The table contains information on the number of DNs associated with each DN prefix. A DN prefix should be as short as possible while being explicit about the DN size. For example, if there is a tandem outgoing route with the access code "966" and it is the only DN that begins with the digit "9," then the DN prefix should be the single digit "9." If there is more than one DN type beginning with the same digit, one of the DNs should be defined using the single digit as a prefix and all the others should be defined using longer DN prefixes that allow for distinction between DN types.

As an example, assume that the following DNs may be received from the CIS CO via the incoming CIS MF Shuttle trunks:

— DNs in the 200-399 range are local Meridian 1 DNs

Tandem calls from the incoming CIS MF Shuttle trunk may be performed to the routes shown in Table 9.

Table 9
Example of DNs received from CIS CO

Outgoing tandem route number	Access code	DN length including the access code
1	4	5
2	5	6
3	6	7

As described in Table 9, five digits (including the outgoing tandem route access code) are expected when tandem calls from the incoming CIS MFS trunk to the outgoing route 1 trunks are originated. Six digits are expected for the outgoing route 2, and seven digits are expected for the outgoing route 3. Therefore, all the DNs which start with the digits 0, 1, 7, 8 and 9 are vacant.

The DN size for the incoming CIS MFS route cannot be defined as fixed because the route may receive DNs which contain 3, 5, 6 or 7 digits. Thus, the Flexible DN Size SSL Table for this route should be defined as described in Table 10.

Table 10
Example of a Flexible DN Size SSL table

SSDG	2	3	4	5	6
CPDC	-	-	-	-	-
TOLL	-	-	-	-	-
ALRM	-	-	-	-	-
TNDM	-	-	-	-	-
SSUC	-	-	-	-	-
NDGT	3	3	5	6	7

The information in the Flexible DN Size SSL table is added to the Route Data Block in Overlay 16.

Multifrequency Signals

For reference purposes, Table 11 defines forward and backward Multifrequency Shuttle protocol signals.

Table 11
MF Shuttle protocol signals

	Signal	Forward signals. A	Backward signal. B
1	700+900	Digit 1.	Send first digit of the called subscriber.
2	700+1100	Digit 2.	Send next digit.
3	900+1100	Digit 3.	Send previous digit.
4	700+1300	Digit 4.	The called subscriber is free.
5	900+1300	Digit 5.	The called subscriber is busy.
6	1100+1300	Digit 6.	Request of the previously sent digit received with mistake. (repetition).
7	700+1500	Digit 7.	Congestion signal.
8	900+1500	Digit 8.	Request to transmit the whole number in form of Dial Pulses.
9	1100+1500	Digit 9.	Request to transmit the remaining digits in Dial Pulse form.
10	1300+1500	Digit 0. (zero digit).	Request to transmit all digits, beginning with previously sent in the Dial Pulse form.
11	700+1700	Automatic call priority. (TOLL call only).	Request to send TOLL call category.
12	900+1700	Confirmation of the backwards signals: 4,5,8 9 and 10.	Spare.
13	1100+1700	Request to repeat the last signal.	Spare.
14	1300+1700	Automatic call no priority. (TOLL call only).	Spare.

Table 11
MF Shuttle protocol signals

	Signal	Forward signals. A	Backward signal. B
15	1500+1700	Operator call. (TOLL call only).	No information received.

Operating parameters

The functionality of Special Service List (SSL) tables has been expanded with the CIS MF Shuttle feature. The Number of Digits (NDGT) prompt is introduced in Overlay 18 to determine the number of digits which should be collected before the seizure of an outgoing CIS MFS trunk or received by an incoming CIS MFS trunk. The values provided in NDGT are used in the configuration of ENBLOCK or Flexible DN Size SSL tables. In addition, the total number of SSL tables in the system has been expanded to 31.

If a call starts in the MF Shuttle mode and ends in the Dial Pulse mode, it is necessary to test for proper Partial Dialing operation. Partial Dialing is unnecessary when the dialing is performed in MF Shuttle mode. MF Shuttle protocol fails when the incoming party issues a backward signal next digit request and the outgoing party has no more dial digits.

It is recommended that Auto DN trunks be defined with the DIP (Dial Pulse) Class of Service.

Feature limitations

The existing limitations of the CIS-specific Digital Trunk Interface cards still apply to CIS MF Shuttle. Therefore, as per existing functionality:

— The data in Automatic Number Identification (ANI) always refers to the first originator of the call. Thus, when a call is transferred the information provided in the ANI message does not correspond with the DN and ANI category of the set to which the call is transferred.

— On outgoing local calls, there is a 700 ms delay in the "Answer" signal recognition before the call is established. This delay is in addition to standard Meridian 1 answer validation timing.

— Data calls are not supported.

— Incoming and outgoing trunks should not be mixed within the same route.

— Toll Operator Break-In/Trunk Offer abilities are not supported.

— Toll Operator Manual Ringing capability is not supported.

Overlap signaling is not supported on outgoing MF Shuttle calls.

Auto Directory Numbers are not allowed in the MF Shuttle protocol.

30 MF Shuttle detectors are simultaneously available on the NTCG01AB CDTI2-MF Shuttle card, and 20 MF Shuttle detectors are simultaneously available on the NTCG02AB CSDTI-MF Shuttle card.

Dial Tone for incoming trunks is not supported by the CIS MF Shuttle feature.

Virtual Network Services are not supported for CIS MF Shuttle trunks.

Feature interactions

Automatic Redial

Automatic Redial (ARDL) receives B-Free/B-Busy information when making CIS MF Shuttle outgoing calls. In this situation, it is not necessary to connect a Tone Detector. If the call is terminated in the Dial Pulse mode, it is necessary to connect a Tone Detector for ARDL.

CIS Digital Trunk Interface

CIS MF Shuttle is based on the CIS Digital Trunk Interface feature. These two features are completely compatible.

Chinese #1 Signaling

The CIS MF Shuttle feature uses Chinese #1 Direct Dial Outward (DDO) to detect the End of Dialing situation. With the introduction of CIS MF Shuttle, End of Dialing conditions are detected with the ENBLOCK SSL tables, as well as the methods already used by Chinese #1 Signaling.

NARS

Network Alternate Route Selection (NARS) has its own ENBLOCK dialing processing. Outgoing local CIS MF Shuttle trunks also require and perform ENBLOCK dialing. Thus, for outgoing NARS calls through CIS MF Shuttle trunks, the following conditions must be met:

— NARS must be configured with the Flexible digit number (FLEN) equal to the maximum possible length of the dial number.

— Inhibit Timeout Handling (ITOH) must be set to NO to allow a call to be attempted after the NARS Interdigit Number (NIT) timer in Overlay 15 has expired (even if fewer digits than the FLEN capacity have been dialed).

— The ENBLOCK SSL table should include only the DNs which have to be sent to the CIS Central Office (CO). For example, DNs which are generated after the NARS translation of the dialed number.

For incoming CIS MF Shuttle calls, the NARS call processing is activated only after all the dialed digits are received from the CIS CO. When the Fixed DN size is used to define the expected number of digits, there is no interaction with NARS. When the Flexible DN size feature is used to define the expected number of digits, the Flexible DN size SSL table must be defined to include DNS which are received from CIS CO. DNs which are generated after the NARS translation are not to be included in the Flexible DN size SSL table.

Networking Features

Only B-Free and B-Busy condition transmitting and receiving are supported. CIS MF Shuttle supports B-Free/B-Busy networking interactions with the following signaling protocols:

— R2/MFC

— ISDN (DPNSS, QSIG, EuroISDN, and MCDN)

— CIS MF Shuttle

— CIS Dial Pulse DID and CO

Incoming CIS MF Shuttle trunks only accept the networking information from the trunks which support the Direct Inward Dial (DID) gateways and the CIS Dial Pulse outgoing CO trunks. Outgoing local CIS MF Shuttle trunks may pass the B-Free/B-Busy networking information to the R2/MFC, ISDN, CIS MF Shuttle and CIS Dial Pulse DID trunks.

Feature packaging

CIS MF Shuttle (CISMFS) is package 326. The following packages are also required:

— Flexible Tones and Cadences (FTC) package 125

— 2 Mbps DTI (DTI2) package 129

— Supplementary Features (SUPP) package 131

Note: The required Chinese #1 DDO is included in package 131.

— Flexible Numbering Plan (FNP) package 160

— CIS Digital Trunk Interface (CIST) package 221

Feature implementation

LD 73 – Configure the NTCG01AB (CDTI2)/NTCG02AB (CSDTI2) card to support both MFS and Dial Pulse protocols.

Prompt	Response	Description
REQ	CHG	Change existing data.
TYPE	DTI2	2.0 Mbps DTI2 Data Block.
FEAT	LPTI	Loop Timers.
LOOP	0-159 0-9	DTI2 loop number. For Option 11C.
CDTI2	YES	CDTI2/CSDTI2 Card.
...		
CISFW	MFS	Multifrequency Shuttle. This will enable both the CIS Dial Pulse and the CIS MFS signaling protocols on the NTCG01AB/NTCG02AB card. DP = Dial Pulse CIS signaling protocol on the NTCG01AA/ NTCG02AA card. NO = Non CIS DTI2 signaling protocols on the NTCG01AB/NTCG02AB or NTCG01AA/NTCG02AA card (default).

LD 18 – Configure MF Shuttle call type handling.

Prompt	Response	Description
REQ	CHG	Change existing data.
TYPE	SSL	Special Service List.
SSL	1-31	Special Service List number.
SSDG	0-9999	Special Service Digits combination.
NDGT	(0)-15	Number of digits which should be collected before seizure of the outgoing CIS MFS trunk or recognition by an incoming CIS MFS trunk. This information comes from the ENBLOCK SSL table or the Flexible DN size SSL table. If the outgoing call is recognized as an MFS call, then the trunk is not seized until the number digits dialed by the user is equal to the NDGT, or the End Of Dialing timer expires, or the OCTO (#) is dialed. If the incoming call is recognized as an MFS call, then the trunk is requested to issue the backward MFS signal to the CIS CO party until the number of digits accepted from the trunk is equal to the NDGT.

LD 16 – Configure CIS MF Shuttle feature in the Route Data Block.

Prompt	Response	Description
REQ	CHG	Change existing data.
TYPE	RDB	Route Data Block.
CUST	xx	Customer number.
ROUT	0-511 0-127	Route number. For Option 11C.
TKTP	DID COT	Direct Inward Dialing. For the incoming trunk route. Central Office Trunk. For the outgoing trunk route.
...		

ICOG	ICT OGT	Incoming only trunks. Outgoing only trunks. MFS routes can be either only incoming or only outgoing.
...		
MFC	CMFS	CIS MFS route. This response is allowed only if both the CIST package 221 and CISMFS package 326 are equipped.
MFSS	(B1) B2 B3	The MFS protocol Start signal. This prompt appears only for incoming CIS MFS routes.
TCRS		The Toll Category Request Supported option is defined for the incoming TOLL CDTI2-MFS routes. The TCRS is prompted only if the MFC is set to CMFS for the incoming routes only.
	(YES) NO	The Toll Category Request is supported (default). The CIS TOLL exchange does not support the TOLL Call Category Request MFS signal (B11).
CNTL	YES	Change controls or timers.
TIMR	DDL 0	Delay Dial Timer not needed.
TIMR	DSI 5000	Disconnect supervision timer - 5 sec value.
TIMR	EOD 14000	End of dial timer for DP originator.
TIMR	ODT 14000	End of dial timer for DTN originator.
TIMR	SFB 25	Seize Fail Busy timer. The recommended value for trunks when seizure supervision is 25 seconds.
TIMR	GTI 128	Incoming Guard timer should be defined with minimum (**not** zero) value.
TIMR	ATO 30000	ANI delay timer should be defined for CIS outgoing trunk routes with 30000 - 50000 ms (30 - 50 sec) value. If the Local Exchange to which the outgoing trunk is connected does not perform the ANI interaction immediately after dialing the Toll access code, the ATO should be defined with the minimum value of 128 ms.
DDO	YES	Delayed Digit Outpulsing must be set to YES for outgoing CIS MFS trunks.

...		
SSL	1-31	The SSL Table number must be defined for both incoming and outgoing routes. For incoming routes, choose to define either the Flexible DN Size or the Fixed DN Size. Only one type of definition is supported per route.
...		
DNSZ	1-7	For the incoming trunks only. The Fixed DN Size can not be used together with the Flexible DN Size.
...		

LD 14 – Configure CIS MF Shuttle trunks.

Prompt	Response	Description
REQ	CHG	Change existing data.
TYPE	DID COT	Direct Inward Dialing. For incoming trunks. Central Office Trunk. For outgoing trunks.
TN	l ch c u	Loop and channel for digital trunks. l = loop 0-159 and ch = channel 1-30 for 2.0 Mbps DTI. Card 1-9 for Option 11C.
CLS	CMFS	CIS MF Shuttle protocol is supported by the trunk. CMFS may be defined only for trunks on the CDTI2/CSDTI2 cards with "CDTI2=YES" and "CISFW=MFS" and only if both the CISMFS package 326 and the CIST package 221 are equipped. Each trunks member of the CIS MFS route can be defined as CFMS or DIP or DIPF.

Feature operation

No specific operating procedures are required to use this feature.

India Phase 2

R2/MFC signaling for India modifies the existing R2/MFC signaling operations of the Meridian 1 to meet the needs of the Indian market. Using R2/MFC for India, a Meridian 1 system can work with both analog and digital (DTI2) interfaces to support India's R2 modified MFC signaling. This feature requires a minimum of X11 Release 23 software and the Multifrequency Compelled Signaling (MFC) package 128.

The development of R2/MFC signaling for India introduces two new prompts in Overlay 16. The India R2/MFC (INDMF) prompt enables R2/MFC operations for India. The CNI length (CLEN) prompt allows for the selection of between one and 16 digits for Calling Number Identification (CNI) operation. CNI operation for India requires 10 digits to be configured at the CLEN prompt. The information provided by CNI can be used for appropriate displays in the system and in features like Malicious Call Trace (MCT).

For India, the following enhancements have been made to existing R2/MFC signaling operation:

— Since India's Central Offices use MFC signaling that support signals defined on 2 out of 5 frequency combinations, a Meridian 1 in India must be configured to recognize only 10 signals. Thus, only 10 frequency signals should be configured in Overlay 94.

— CNI operation in India allows the terminating party to send the Send Category (SCAT) signal at any time while the address information is being exchanged in the protocol. For this to occur at the originating end, the SCNT prompt in Overlay 94 must be set to YES.

— The Called Line Free with Metering signal (B.6) is used in India to indicate that the called party is free from calls (idle). The Meridian 1's existing IDLE signal should be configured as B.6 to meet this requirement.

— The Called Line Free With No Metering signal (B.7) is not supported by Meridian 1 systems in India and should **not** be configured because it is used for test purposes.

— India's Central Offices use the A.2 signal, Restart, to request the originating party to start resending the dialed digits from the beginning. The existing Tandem First (TFST) signal should be configured as A.2 in Overlay 94 for the Meridian 1 to support this signal.

— The A.3, A.4, and A.5 signals are used in Overlay 94 for the application of CNI signals. In the operation of R2/MFC signaling for India the A.3 signal acts as the MFC Complete signal, A.4 acts as the Send/Receive CNI signal, and A.5 acts as the Send/Receive CNI category signal.

— The length of CNI digits for India is fixed at 10. Once the terminating end receives 10 digits, it sends a COMP signal to end the CNI sequence and the level 1 signaling. For R2/MFC signaling in India, the maximum number of CNI digits should be defined as 10 in Overlay 16. However, configuration of up to 16 digits is now available as a result of this feature.

Operating parameters

For a tandem Meridian 1, the incoming and outgoing R2/MFC Data Blocks should be configured with different values of EECD in Overlay 94. This will prevent a Meridian 1 nearest to an Indian CO from establishing an end-to-end connection between the Indian CO and a far-end Meridian 1 that may not support R2/MFC signaling for India. The far end Meridian 1 must have SCNT set to YES in Overlay 94.

Feature interactions

There are no specific Feature interactions for this feature.

Feature packaging

R2/MFC for India requires the MFC package 128.

Feature implementation

Multifrequency Compelled Signaling (MFC) tables are set up in Overlay 94 for incoming and outgoing signaling, as described in the following Overlay tables. To disable certain signals, assign the value of zero (0) to the respective signal name.

LD 94 – Configure MFC tables (Incoming table).

Prompt	Response	Description
REQ	NEW CHG	Add new data Change existing data
TYPE	R2MF	R2/MFC table
ICOG	ICT	Incoming table
MAXT	(1) - 127	Maximum number of tables
TBNO	1 - 127	Table number to configure
EECD	1 - 127	End-to-end signaling code. EECD defaults to the TBNO table number when REQ = NEW. For a tandem Meridian 1 system, the incoming and outgoing R2/MFC Data Blocks should be configured with different values of EECD.
LVNO	1	MFC signal level number
DFLT	0 - 127	Table to use for default values
RECV		
XMIT	COMP 3	A.3 as MFC Complete signal
XMIT	SCNI 4	A.4 as Send CNI signal
XMIT	SCAT 5	A.5 as Send Category signal
LVNO	2	MFC signal level number
DFLT	0 - 127	Table to use for default values
RECV	<cr>	Stop RECV prompts
XMIT	IDLE 6	B.6 to be used as the IDLE signal

LD 94 – Configure MFC tables (Outgoing table).

Prompt	Response	Description
REQ	NEW CHG	Add new data Change existing data
TYPE	R2MF	R2/MFC table
ICOG	OGT	Outgoing table
MAXT	(1) - 127	Maximum number of tables
TBNO	1 - 127	Table number to configure
...		
EECD	1 -127	End-to-end signaling code. EECD defaults to the TBNO table number when REQ = NEW. For a tandem Meridian 1 system, the incoming and outgoing R2/MFC Data Blocks should be configured with different values of EECD.
SCNT	YES	To allow processing of SCAT signal at any time during signaling exchange.
LVNO	1	MFC signal level number
DFLT	0 - 127	Table to use for default values
RECV	2 TFST	A.2 to be interpreted as Tandem First Signal (Restart)
RECV	3 COMP	A.3 as MFC Complete signal
RECV	4 SCNI	A.4 as Receive CNI signal
RECV	5 SCAT	A.5 as Receive Category signal
XMIT	<cr>	Stop XMIT prompts
LVNO	2	MFC signal level number
DFLT	0 - 127	Table to use for default values
RECV	6 IDLE	B.6 to be interpreted as IDLE

The MFC Sender/Receiver is configured in Overlay 13.

LD 13 – Set up MFC TNs.

Prompt	Response	Description
REQ	NEW CHG	Add new data Change existing data
TYPE	MFC	Multifrequency Compelled Sender/Receiver data block. Multifrequency Compelled Signaling (MFC) package 128 is required.
TN	l s c u c u	Terminal Number (MFC) For Option 11C

R2/MFC signaling is configured on a route basis in Overlay 16.

LD 16 – Set up R2/MFC Route Data Block.

Prompt	Response	Description
REQ	CHG	Change existing data
TYPE	RDB	Route Data Block
CUST	xx	Customer number
ROUT	0-511 0-127	Route number For Option 11C
...		
SIGO	STD	Standard signaling arrangement
MFC	YES	Multifrequency Compelled (MFC) Signaling
INDMF	(NO) YES	Indian R2/MFC operations disabled Indian R2/MFC operations (enabled)
- CLEN	1-(10)-16	Select 10 CNI digits for Indian operations
MFCI	1-127	MFC Incoming table number configured in LD 94

...		
MFCO	1-127	MFC Outgoing table number configured in LD 94

R2MFC signaling is configured on a trunk basis in Overlay 14.

LD 14 – Configure trunk on the Route as MFC Trunk.

Prompt	Response	Description
REQ	CHG	Change existing data
TYPE	xxx	Trunk type (DID or TIE)
TN	l s c u c u	Terminal Number For Option 11C
CUST	xx	Customer number
NCOS	7	Network class of service
CLS	MFC CNA	Allow MFC class of service and Calling Number Identification

Feature operation

No specific operating procedures are required to use this feature.

MFC Interworking with AML Based Applications

The Multifrequency Compelled Signaling (MFC) Interworking with Application Module Link (AML) Based Applications feature improves the interworking of AML based applications, specifically Customer Controlled Routing (CCR) and Host Enhanced Routing (HER), and R2MFC trunks. R2MFC trunks are widely used throughout Europe, Asia/Pacific, and Latin America. The same degree of conformance to the R2MFC protocol is ensured for calls terminating on a Control DN (CDN) which is controlled by CCR or HER, as for calls terminating on any other DN.

R2MFC signaling on DID or TIE trunks provides a register signaling (trunk dialing) method in addition to the other methods supported on the Meridian 1. DID or TIE trunks using R2MFC signaling continue to have normal treatment, except during the dialing phase where R2MFC protocols are followed. These protocols call for forward signals to be used by the originating end to convey address information, and backward signals to be used by the terminating end to acknowledge the forward signals and indicate the status of the terminating party or request additional information from the originating party. When the backward signal is received, the forward signal is removed, which in turn forces the backward signal to also be removed. This compelled sequence is repeated until the protocol is completed.

In order to increase the signaling capacity, each of the 15 forward and backward signals is used with more than one meaning or function. A set of functions is defined to be a signaling level. When required, one or more groups are sequentially used throughout an R2MFC protocol.

When the called party is a CDN controlled by CCR, the attempt to terminate the call results in the call being temporarily queued in the CDN queue. The Meridian 1 then sends a message over the AML link to the application module, notifying the CCR application of the call. After CCR determines the first treatment to be given to the call, it sends the appropriate request message to the Meridian 1. This treatment determines the backward signal to be returned to the originating end before the call can be completed. Once this is done, R2MFC signaling no longer affects the call.

Operating parameters

There are no operating parameters for this feature.

Feature interactions

Calling Line Identification

If the Calling Line Identification (CLID) package is equipped and if the incoming R2MFC trunk is configured with Calling Number Allowed (CNA) Class of Service, the Calling Number Identification is passed to the CCR application in the incoming call notification message and can be used by CCR in routing decisions.

China Number 1 Signaling - Toll Operator Break-In

The Toll Operator Break-In feature is activated after the MFC Level II processing forward signal TOLL OPERATOR BREAK-IN has been received prior to termination on a station busy on a non-toll call for which break-in is allowed. The Level II MFC backward signal that is returned is BUSY, BREAK-IN IS ALLOWED, instead of the standard STATION BUSY. This feature is supported if CCR routes such an incoming R2MFC call to a busy station.

However, if CCR gives the FORCE BUSY treatment to the call, the signal returned is BUSY, BREAK-IN IS NOT ALLOWED, since in this case there is no call in which to break-in. This is also true if the call terminates on a CDN in default mode and is given busy treatment, because the maximum number of calls in the default ACD queue via this CDN has already been reached.

Dialed Number Identification Services Length Flexibility

If the R2MFC route is configured with the Dialed Number Identification Service (DNIS) option, the DNIS is passed to the CCR application in the incoming call notification message and can be used by CCR in routing decisions.

Gateways

The CCR ROUTE TO command may route the incoming R2MFC call to an outgoing trunk. It succeeds only for those trunks for which a gateway with MFC exists.

Feature packaging

The MFC Interworking with AML Based Applications feature requires the following packages:

— Multifrequency Compelled Signaling (MFC) package 128

— Enhanced Automatic Call Distribution Routing (EAR) package 214, and

— Enhanced Call Trace (ECT) package 215.

Feature implementation

No change to existing configuration is required for the MFC Interworking with AML Based Applications feature.

Feature operation

No specific operating procedures are required to use this feature.

Process Notification for Networked Calls

In an existing R2MFC Meridian 1 network, when an outgoing call hops through more than two R2MFC steps, it experiences a delay during which the caller may drop the call.

The Process Notification for Networked Calls feature informs the user that the call is in progress during such a delay, using a configured message or a tone. This feature is enabled on a per route basis. The user has an option to configure the choice of announcement, a message or a tone. When the first digit on an MFC trunk is outpulsed, and if the user waits for more than 6 seconds (default configuration) between the digits or after all the digits, the Process Notification tone or message is given.

If the announcement is a RAN message and it ends, a pause timer is started, otherwise a tone is given as per the configuration in the FTC table. When the pause timer expires the RAN announcement is given again (depending on the configuration of NMSG).

If the user continues to dial, the announcement is stopped and the notification delay timer is restarted. The digit is outpulsed.

The Process Notification is abruptly stopped in the event that the call is completed successfully, or in the event the call is dropped due to a busy destination set, one of the legs of the R2MFC trunks is busy, the MFC timed out waiting for a response, or the caller hangs up.

Operating parameters

This feature applies to options 11C, 51C, 61C, 81, and 81C systems running X11 Release 24 or later software. The feature can be configured on any type of outgoing trunks supporting MFC signaling.

This feature requires a Recorded Announcement route already configured to give a RAN announcement. It will not impact the functionality of the RAN hardware.

If the RAN trunks are busy and unavailable to give a message, then tone is given.

When an attendant receives a Process Notification announcement and puts the call on hold/presses another loop key, the Process Notification announcement is stopped.

Feature interactions

Call Forward

When a call of any sort is forwarded on an MFC route configured for Process Notification, the originating party listens to the announcement if the call takes more than the notification delay timer value configured for the route. The originating party must be in the same Meridian 1. This treatment will not be given for an external call forwarded to an external number.

DISA

When a user calls an external number using DISA on a Process Notification configured route, the user is given the announcement as per the configuration on the route.

Call Transfer

The Process Notification announcement is given only to the user who transfers the call.

Conference

The Process Notification announcement is given only to the user who initiates the conference.

No-Hold Conference

During the establishment of No-Hold Conference, the Process Notification announcement is taken off. Therefore, the Process Notification announcement is not heard by any of the parties involved.

Special Dial Tone after Dialed Numbers

If at any time a special dial tone is given by another feature, the Process Notification treatment will not be provided. During the Process Notification announcement, if a special dial tone has to be given, the preference is given for the special dial tone and the Process Notification announcement is removed immediately.

MFC Signaling

The Process Notification for Networked Calls feature does not affect the signaling protocol, it only initiates certain actions for the feature.

RAN/MIRAN

The feature has to use a RAN route already configured to give a Recorded Announcement. It does not impact the functionality of the RAN machine, Universal Trunk card, or MIRAN card, it only uses the functionality provided by it.

RAN Broadcast

The Process Notification for Networked Calls feature does not affect the signaling protocol, it only initiates certain actions for the feature.

Expensive route warning tone

This feature, and other features like this, which introduce a tone before the trunk is seized and the first digit is outpulsed, do not have any interactions with the Process Notification for Networked Calls feature.

Feature packaging

This feature requires the Multi Frequency Compelled Signaling (MFC) package, package128.

The Flexible Tones and Cadences (FTC) package, package 125, is required if a tone is to be provided.

The Recorded Announcement (RAN) package, package 7, is required in order to provide a recorded announcement.

Feature implementation

LD 56– Configuration of Flexible Tones and Cadences.

Prompt	Response	Description
REQ	NEW CHG	Add new data. Change existing data.
TYPE	FTC	Flexible Tones and Cadences.
TABL	0-31	FTC table number.
DFLT	0-31	Default table number.
RING	<CR>	
HCCT	<CR>	
SCCT	YES	Change software controlled cadence tone definitions.
...	...	...
PNNC	<CR>	PNNC Cadence.
- XTON	(0)-255	NT8D17 TDS Tone code.
- XCAD	(0)-255	NT8D17 cadence code for FCAD.
- CDNC	(0)-255	MCAD table entry for this cadence.
...	...	...

LD 56 – Configuration procedure for FCAD.

Prompt	Response	Description
REQ	NEW CHG	Add new data. Change existing data.
TYPE	FCAD	Firmware cadence table.
WCAD	0-255	Cadence number in master cadence table.
CDNC	0410 0820	2 seconds on, 4 seconds off.

LD 56 – Configuration procedure for MCAD.

Prompt	Response	Description
REQ	NEW CHG	Add new data. Change existing data.
TYPE	MCAD	Master cadence table.
WCAD	0-255	Cadence number in master cadence table.
CDNC	0410 0820	2 seconds on, 4 seconds off.

LD 16 – Enable PNNC and configure route to provide Recorded Announcement message.

Note: A RAN machine/MIRAN card is used to play the recorded announcement. This RAN machine/MIRAN card is started/stopped by the software. The requirement of a RAN machine/MIRAN card already configured is mandatory for a message to be played.

Prompt	Response	Description
REQ	CHG	Change existing data.
TYPE	RDB	Route Data Block.
CUST	xx	Customer number as defined in LD 15.
ROUT	0-511	Route number.
...	...	...
PNNC	YES	PNNC feature is enabled.
- PNDL	2-(6)-10	Notification delay timer value.
- SLCT	MSG	RAN message is configured.
- - NRT	0-511	Enter the already configured RAN route number.
- - NMSG	(0)-30	Number of times the message should be repeated.
- - PNPS	(0)-30	The interval between the recorded announcements.
...	...	

LD 16 – Enable PNNC and configure route to provide tone.

Prompt	Response	Description
REQ	CHG	Change existing data.
TYPE	RDB	Route Data Block.
CUST	xx	Customer number as defined in LD 15.
ROUT	0-511	Route number.
...	...	...
PNNC	YES	PNNC feature is enabled.
- PNDL	2-(6)-10	Notification delay timer value.
- SLCT	TONE	Tone is configured.
...	...	...

Feature operation

There are no specific operating procedures required to use this feature.

R2 Multifrequency Compelled Signaling 1.5 Mbps Digital Trunk Interface

Prior to this development, R2 Multifrequency Compelled Signaling (R2MFC) inter-register signaling was only supported on DTI2 and analog trunks. The R2MFC 1.5 Mbps Digital Trunk Interface feature enables R2MFC signaling on 1.5 Mbps DTI trunks.

Operating parameters

Alternative Loss Plan is not supported.

This product improvement does not support the R2MFC DID/DTMF DOD feature.

Feature interactions

Alternative Loss Plan

Alternative Loss Plan is not supported on 1.5 Mbps DTI.

MFC Signaling

Since this product improvement introduces MFC on DTI trunks, any interaction with existing MFC signaling also applies to this feature.

1.5 Mbps DTI

Since this product improvement introduces MFC on DTI trunks, any interaction with 1.5 Mbps DTI also applies to this feature.

Feature packaging

This feature is packaged under 1.5 Mbps Digital Trunk Interface (PBXI) package 75.

The following package is also required:

— Multifrequency Compelled Signaling (MFC) package 128.

Feature implementation

LD 16 – Enable MFC to be configured on a DTI route.

Prompt	Response	Description
REQ	NEW, CHG	Add, or change.
TYPE	RDB	Route Data Block.
...		
DTRK	YES	Digital Trunk Route.
DGTP	DTI	Digital Trunk Type for Route.
...		
MFC	YES	Multifrequency Compelled Signaling.
MFCI	1-127	MFC Incoming table number. Enter 0 to remove Incoming table.
R2MD	(NO), YES	R2 modification.
SGL	(NO), YES	Return MFC idle signal.
BSSU	(NO), YES	Backward Signal Suppression.
MFCO	1-127	MFC Outgoing table number. Enter 0 to remove Outgoing table.

LD 14 – Enable MFC Class of Service on a 1.5 Mbps route.

Prompt	Response	Description
REQ	NEW, CHG	Add, or change.
TYPE	TIE, DID	Trunk type.
...		
RTMB	1-127 1-126	Route Number. Member number. Enter a valid DTI route.
CLS	MFC	MFC Class of Service.
MFL	XX	Multifrequency Digit Level. ***Note:*** The MFPD prompt will not appear.

Feature operation

No specific operating procedures are required to use this feature.

R2MFC CNI/CDR Enhancements

The R2 Multifrequency Compelled Signaling (R2MFC) Calling Number Identification (CNI)/Call Detail Recording (CDR) Enhancements feature provides the following capabilities across an R2MFC/ISDN gateway:

— the mapping of the R2MFC CNI to the ISDN CLID, and vice versa;

— the location of the captured CNI in the CDR is an option to a customer. The CNI may appear in the digits field, the CLID field in line two or not appear at all in the CDR; and

— the CNI is provided to the ACD MAX, Network ACD, and Radio Paging equipment, similar to how the CLID has been provided before the introduction of this feature.

Examples of CDR formats

The following examples provide cases of the CNI (23008) appearing in the digits field, in the CLID field in line two, and not appearing at all in the CDR.

CDR record with CNI in digits field

```
N 003 00 T078001 T008001 31/05 1:40:05  05:30.5  C23008
 &                       0000 0000
```

CDR record with CNI in CLID field

```
N 003 00 T078001 T008001 31/05 13:40:05  0:05:30.5  71082317
 &23008xxxxxxxxxx 0000 0000
```

CDR record with no CNI appearance

```
N 003 00 T078001 T008001 31/05 13:40:05  0:05:30.5  71082317
 &                       0000 0000
```

Operating parameters

The feature is applicable to Meridian 1 Options 11C, 51C, 61C, 81 and 81C systems.

The maximum length of the CLID field in the CDR is 16 digits.

This feature applies to all supported ISDN interfaces.

On the ISDN side of the R2MFC/ISDN gateway, the ISDN access may be via ISDN Primary Rate Interface (PRI), ISDN Signaling Link (ISL), Virtual Network Services (VNS) or Basic Rate Interface (BRI) trunks.

This feature does not affect the manner in which the CNI is composed at the originating switch of an R2MFC/ISDN gateway.

If the CNI cannot be composed at a R2MFC/ISDN gateway tandem switch, the CNI DN and the Trunk ID will be sent in the CNI (as was the functionality prior to the introduction of this feature).

Feature interactions

Calling Party Privacy

If the CLID is received with presentation denied, it is not mapped to the CNI. Instead, the CNI is composed of the CNI DN and the Trunk ID. Optionally, the CNI request may set to ECNI (the CNI End-of-CNI R2MFC level 1 forward signal).

Display Calling Party Denied

If the CLID is received with Display Calling Party Denied, it is not mapped to the CNI. Instead, the CNI is composed of the CNI DN and the Trunk ID. Optionally, the CNI request may set to ECNI (the CNI End-of-CNI R2MFC level 1 forward signal).

EuroISDN Continuation

The outgoing CLID element of the EuroISDN Continuation feature is mutually exclusive with the R2MFC CNI/CDR Enhancements feature. If the CLID is to be composed from the EuroISDN Continuation feature, it will not contain the CNI. If the CLID is to be composed from the CNI, no prefixes will be added to the number.

Feature Group D

Feature Group D trunks do not support CNI. If a CNI is available in addition to the CLID on a Feature Group D trunk, the CLID of the Feature Group D trunk would be used for the CLID.

In-Band Automatic Number Identification (IANI)

Inband ANI trunks do not support CNI. If a CNI is available in addition to the IANI on an IANI trunk, the IANI would be used for the CLID.

Incoming Trunk Programmable CLID

Incoming Trunk Programmable CLID takes precedence over the R2MFC CNI/CDR Enhancements feature. If the outgoing ISDN trunk is allowed to send a billing number, the billing number is sent out as the CLID, not the CNI from the incoming trunk.

M911

M911 trunks do not support CNI. If a CNI is available on an M911 trunk in addition to the ANI, the ANI would be used for the CLID.

R2MFC to DPNSS1 Gateway

The R2MFC CNI/CDR Enhancements feature uses the CNI request enhancement (Upfront CNI) developed for the R2MFC to DPNSS1 Gateway feature.

Feature packaging

For the CNI/CLID tandeming enhancement, the following software packages are required:

— Multifrequency Compelled Signaling (MFC) package 128;

— Integrated Services Digital Network (ISDN) package 145;

— 1.5 Mbps Primary Rate Access (PRA) package 146; **or** ISDN Signaling Link (ISL) package 147; **or** 2.0 Mbps Primary Rate Access (PRI2) package 154; **or** Virtual Network Services (VNS) package 183; **or** Basic Rate Interface Trunk Access (BRIT) package 233; which requires Basic Rate Interface (BRI) package 216;

— For EuroISDN applications, EuroISDN (EUROISDN) package 261; and

— For QSIG applications, QSIG (QSIG) package 263.

For the CDR enhancement, the following software packages are required:

— Call Detail Recording (CDR) package 4;

— To print or store the CDR record, Call Detail Recording on Teletype Machine (CTY) package 5;

— Calling Line Identification in Call Detail Recording (CCDR) package 118; and

— New Format Call Detail Recording (FCDR) package 234.

Feature implementation

The following steps are required to configure the R2MFC CNI/CDR Enhancements feature:

— In LD 17, configure the CDR system parameters;

— In LD 15, configure the CDR field (if any) in which the CNI will appear;

— In LD 15, configure the CNI presentation option;

— In LD 16, configure the CDR option to provide CDR records for calls;

— In LD 16, configure the CLID/CNI request options for an R2MFC trunk route (incoming);

— In LD 16, configure the CLID/CNI request options for an R2MFC trunk route (outgoing);

— In LD 16, configure the CLID/CNI request options for an R2MFC trunk route (incoming and outgoing);

— In LD 16, configure the CLID/CNI request options for an ISDN trunk route (incoming);

— In LD 16, configure the CLID/CNI request options for an ISDN trunk route (outgoing);

— In LD 16, configure the CLID/CNI request options for an ISDN trunk route (incoming and outgoing); and

— In LD 16, configure the CLID/CNI request options for an R2MFC route (incoming and outgoing) whose signaling is supported by a D-Channel (ISL).

LD 17 – Configure the CDR system parameters.

Prompt	Response	Description
REQ	CHG	Change the existing data.
TYPE	PARM	Change system parameters.
- FCDR	NEW	New format for Call Detail Recording.
...		
- CLID	YES	Calling Line ID in the CDR.
...		

LD 15 – Configure the CDR field (if any) in which the CNI will appear.

Prompt	Response	Description
REQ:	CHG	Change the existing data.
TYPE:	CDR	Call Detail Recording data.
CUST	xx	Customer number.
...		
- PORT	0-15	CDR port.
- CNI		The CDR field (if any) in which the CNI will appear.
	(DGTS) CLID NONE	The CNI is recorded in the digits field. The CNI is recorded in the CLID field. The CNI is not captured in the CDR.
...		

LD 15 – Configure the CNI presentation option.

Prompt	Response	Description
REQ:	CHG	Change the existing data.
TYPE:	NET	Networking data.

CUST	xx	Customer number.
ISDN	YES	ISDN.
...		
- CNDN	0-99999999	Customer CNI DN on outgoing MFC calls (maximum length is eight digits.)
- CNIP	(YES) NO	Option to send CNI when CLID has presentation denied. YES = The default. Send the CNI DN and the Trunk ID. NO = Do not send a CNI.

LD 16 – Configure the CDR option to provide CDR records for calls.

Prompt	**Response**	**Description**
REQ	CHG	Change the existing data.
TYPE	RDB	Route Data Block.
CUST	xx	Customer number.
ROUT	0-511	Route number.
TKTP	DID TIE	Trunk route type.
...		
CDR	YES	Call Detail Recording.
- INC	YES	CDR on incoming calls.
...		
- OAL	YES	CDR on outgoing calls.
...		

LD 16 – Configure the CLID/CNI request options for an **R2MFC** trunk route (**incoming**.)

Prompt	Response	Description
REQ	CHG	Change the existing data.
TYPE	RDB	Route Data Block.
CUST	xx	Customer number.
ROUT	0-511	Route number.
TKTP	DID TIE	Trunk route type.
...		
ICOG	ICT	Incoming trunk route
...		
MFC	YES	MFC.
MFCI	1-127	MFC Incoming table number; must be a non-zero value.
...		
ICIS		Incoming Identifier that is sent.
	YES	YES = The default. Use the CLID/CNI from the incoming ISDN/R2MFC trunk. Prompted for incoming trunks (i.e., if ICOG = ICT), and if the route type is R2MFC or ISDN.
ICNP		Incoming Numbering Plan.
	(UKWN) PRV PUB	Unknown. Private Public Prompted if the route type is R2MFC and ICIS = YES.

ICNT		Incoming Numbering Type.
	(UKWN) INTL NTN LCL LOC CDP SPN	Unknown Number. International Number. National Number. Local Number. Location Number. Coordinated Dialing Plan. Special Number.
		Prompted if the route type is R2MFC and ICIS = YES.
ICPS		Incoming Presentation Status.
	YES	YES = Indicate the presentation status of the CLID.
		Prompted if the route type is R2MFC and ICIS = YES.
CNTL	...	
...		
ALRM	...	
NCNI	(0)-7	Request CNI after the defined number of digits are received. If NCNI = 0 (the default), the CNI request does not depend on the number of digits received. If the value for NCNI is defined to be greater than the accepted number of digits required for routing the call, CNI will not be requested but the call is routed. The NCNI prompt is requested if the trunk type is DID or TIE, the MFC signaling is R2MFC, and the MFC signaling table is defined on the route.
CNIE	YES (NO)	Request CNI after an ESN code is dialled. If the value of NCNI has been defined as greater than zero (in response to the NCNI prompt) and CNIE is set to YES, CNI is requested when either one of the conditions is met. The CNIE prompt is requested if the trunk type is DID or TIE, the MFC signaling is R2MFC, and the MFC signaling table is defined on the route.
CNIT	...	

LD 16 - Configure the CLID/CNI request options for an **R2MFC** trunk route (**outgoing**.)

Prompt	Response	Description
REQ	CHG	Change the existing data.
TYPE	RDB	Route Data Block.
CUST	xx	Customer number.
ROUT	0-511	Route number.
TKTP	DID TIE	Trunk route type.
...		
ICOG	OGT	Outgoing trunk route
...		
MFC	YES	MFC.
MFCO	1-127	MFC outgoing table number; must be a non-zero value.
...		
SWP	...	
OGIS		Outgoing Identifier that is sent.
	YES	YES = The default. Use the CLID/CNI from the incoming ISDN/R2MFC trunk, or from the calling set. Prompted for outgoing trunks (i.e., if ICOG = OGT), and if the route type is R2MFC or ISDN.
CNTL	...	
...		
ALRM	...	

NCNI	(0)-7	Request CNI after the defined number of digits are received. If NCNI = 0 (the default), the CNI request does not depend on the number of digits received. If the value for NCNI is defined to be greater than the accepted number of digits required for routing the call, CNI will not be requested but the call is routed. The NCNI prompt is requested if the trunk type is DID or TIE, the MFC signaling is R2MFC and the MFC signaling table is defined on the route.
CNIE	YES (NO)	Request CNI after an ESN code is dialed. If the value of NCNI has been defined as greater than zero (in response to the NCNI prompt) and CNIE is set to YES, CNI is requested when either one of the conditions is met. The CNIE prompt is requested if the trunk type is DID or TIE, the MFC signaling is R2MFC and the MFC signaling table is defined on the route.
CNIT	...	

LD 16 - Configure the CLID/CNI request options for an **R2MFC** trunk route (**incoming and outgoing**.)

Prompt	**Response**	**Description**
REQ	CHG	Change the existing data.
TYPE	RDB	Route Data Block.
CUST	xx	Customer number.
ROUT	0-511	Route number.
TKTP	DID TIE	Trunk route type.
...		
ICOG	IAO	Incoming and outgoing trunk route.
...		
MFC	YES	MFC.

MFCI	1-127	MFC Incoming table number; must be a non-zero value.
...		
MFCO	1-127	MFC outgoing table number; must be a non-zero value.
...		
SWP	...	
ICIS		Incoming Identifier that is sent.
	YES	YES = The default. Use the CLID/CNI from the incoming ISDN/R2MFC trunk. Prompted for incoming trunks (i.e., if ICOG = ICT), and if the route type is R2MFC or ISDN.
ICNP		Incoming Numbering Plan.
	(UKWN) PRV PUB	Unknown. Private Public Prompted if the route type is R2MFC and ICIS = YES.
ICNT		Incoming Numbering Type.
	(UKWN) INTL NTN LCL LOC CDP SPN	Unknown Number. International Number. Local Number. Location Number. Coordinated Dialing Plan. Special Number. Prompted if the route type is R2MFC and ICIS = YES.
ICPS		Incoming Presentation Status.
	YES	YES = Indicate the presentation status of the CLID. Prompted if the route type is R2MFC and ICIS = YES.
OGIS		Outgoing Identifier that is sent.
	YES	YES = The default. Use the CLID/CNI from the incoming ISDN/R2MFC trunk, or from the calling set. Prompted for outgoing trunks (i.e., if ICOG = OGT), and if the route type is R2MFC or ISDN.
CNTL	...	

...		
ALRM	...	
NCNI	(0)-7	Request CNI after the defined number of digits are received. If NCNI = 0 (the default), the CNI request does not depend on the number of digits received. If the value for NCNI is defined to be greater than the accepted number of digits required for routing the call, CNI will not be requested but the call is routed. The NCNI prompt is requested if the trunk type is DID or TIE, the MFC signaling is R2MFC, and the MFC signaling table is defined on the route.
CNIE	(NO) YES	Request CNI after an ESN code is dialed. If the value of NCNI has been defined as greater than zero (in response to the NCNI prompt) and CNIE is set to YES, CNI is requested when either one of the conditions is met. The CNIE prompt is requested if the trunk type is DID or TIE, the MFC signaling is R2MFC, and the MFC signaling table is defined on the route.

LD 16 - Configure the CLID/CNI request options for an **ISDN** trunk route (**incoming**.)

Prompt	**Response**	**Description**
REQ	CHG	Change the existing data.
TYPE	RDB	Route Data Block.
CUST	xx	Customer number.
ROUT	0-511	Route number.
TKTP	DID TIE	Trunk route type.
...		
ISDN	YES	ISDN.
- MODE	PRA	ISDN Primary Rate Access mode of operation.

...		
- IFC		Interface type.
	APAC	Asia Pacific.
	AXEA	Ericsson AXE-10 for Australia.
	AXES	Ericsson AXE-10 for Sweden.
	D70	Japan D70.
	D100	Meridian DMS-100.
	D250	Meridian DMS-250.
	ESIG	ETSI QSIG.
	ESS4	AT&T ESS#4.
	ESS5	AT&T ESS#5.
	EURO	EuroISDN.
	ISIG	ISO QSIG.
	NUME	Numeris for France.
	S100	Meridian SL-100.
	(SL1)	Meridian SL-1.
	SS12	SYS-12 for Norway.
	TCZ	NEAX-61 for New Zealand.
	1TR6	Germany 1TR6.
- - CNTY		Enter country pertaining to EuroISDN and Asia Pacific interface type (if IFC = EURO or APAC.)
	AUS	Austria.
	AUST	Australia.
	DEN	Denmark.
	DUT	Holland.
	EIR	Ireland.
	(ETSI)	ETSI basic protocol.
	FIN	Finland.
	FRA	France.
	GER	Germany.
	HKNG	Hong Kong.
	ITA	Italy.
	NOR	Norway.
	POR	Portugal.
	SING	Singapore.
	SWE	Sweden.
	SWI	Switzerland.
	TCNZ	New Zealand.
	THAI	Thailand.
...		
ICOG	ICT	Incoming trunk route.

...		
ICIS		Incoming Identifier that is sent.
	YES	YES = The default. Use the CLID/CNI from the incoming ISDN/R2MFC trunk. Prompted for incoming trunks (i.e., if ICOG = ICT), and if the route type is R2MFC or ISDN.
CNTL	...	

LD 16 - Configure the CLID/CNI request options for an **ISDN** trunk route (**outgoing**.)

Prompt	**Response**	**Description**
REQ	CHG	Change the existing data.
TYPE	RDB	Route Data Block.
CUST	xx	Customer number.
ROUT	0-511	Route number.
TKTP	DID TIE	Trunk route type.
...		
ISDN	YES	ISDN.
- MODE	PRA	ISDN Primary Rate Access mode of operation.
...		

- IFC		Interface type.
	APAC	Asia Pacific.
	AXEA	Ericsson AXE-10 for Australia.
	AXES	Ericsson AXE-10 for Sweden.
	D70	Japan D70.
	D100	Meridian DMS-100.
	D250	Meridian DMS-250.
	ESIG	ETSI QSIG.
	ESS4	AT&T ESS#4.
	ESS5	AT&T ESS#5.
	EURO	EuroISDN.
	ISIG	ISO QSIG.
	NUME	Numeris for France.
	S100	Meridian SL-100.
	(SL1)	Meridian SL-1.
	SS12	SYS-12 for Norway.
	TCZ	NEAX-61 for New Zealand.
	1TR6	Germany 1TR6.
- - CNTY		Enter country pertaining to EuroISDN and Asia Pacific interface type (if IFC = EURO or APAC.)
	AUS	Austria.
	AUST	Australia.
	DEN	Denmark.
	DUT	Holland.
	EIR	Ireland.
	(ETSI)	ETSI basic protocol.
	FIN	Finland.
	FRA	France.
	GER	Germany.
	HKNG	Hong Kong.
	ITA	Italy.
	NOR	Norway.
	POR	Portugal.
	SING	Singapore.
	SWE	Sweden.
	SWI	Switzerland.
	TCNZ	New Zealand.
	THAI	Thailand.
...		
ICOG	OGT	Outgoing trunk route.
...		

OGIS		Outgoing Identifier that is sent.
	YES	YES = The default. Use the CLID/CNI from the incoming ISDN/R2MFC trunk, or from the calling set. Prompted for outgoing trunks (i.e., if ICOG = OGT), and if the route type is R2MFC or ISDN.
CNTL	...	

LD 16 - Configure the CLID/CNI request options for an **ISDN** trunk route (**incoming and outgoing**.)

Prompt	**Response**	**Description**
REQ	CHG	Change the existing data.
TYPE	RDB	Route Data Block.
CUST	xx	Customer number.
ROUT	0-511	Route number.
TKTP	DID TIE	Trunk route type.
...		
ISDN	YES	ISDN.
- MODE	PRA	ISDN Primary Rate Access mode of operation.
...		

- IFC		Interface type.
	APAC	Asia Pacific.
	AXEA	Ericsson AXE-10 for Australia.
	AXES	Ericsson AXE-10 for Sweden.
	D70	Japan D70.
	D100	Meridian DMS-100.
	D250	Meridian DMS-250.
	ESIG	ETSI QSIG.
	ESS4	AT&T ESS#4.
	ESS5	AT&T ESS#5.
	EURO	EuroISDN.
	ISIG	IISO QSIG.
	NUME	Numeris for France.
	S100	Meridian SL-100.
	(SL1)	Meridian SL-1.
	SS12	SYS-12 for Norway.
	TCZ	NEAX-61 for New Zealand.
	1TR6	Germany 1TR6.
- - CNTY		Enter country pertaining to EuroISDN and Asia Pacific interface type (if IFC = EURO or APAC.)
	AUS	Austria.
	AUST	Australia.
	DEN	Denmark.
	DUT	Holland.
	EIR	Ireland.
	(ETSI)	ETSI basic protocol.
	FIN	Finland.
	FRA	France.
	GER	Germany.
	HKNG	Hong Kong.
	ITA	Italy.
	NOR	Norway.
	POR	Portugal.
	SING	Singapore.
	SWE	Sweden.
	SWI	Switzerland.
	TCNZ	New Zealand.
	THAI	Thailand.
...		
ICOG	IAO	Incoming and outgoing trunk route.
...		

ICIS		Incoming Identifier that is sent.
	YES	YES = The default. Use the CLID/CNI from the incoming ISDN/R2MFC trunk. Prompted for incoming trunks (i.e., if ICOG = ICT), and if the route type is R2MFC or ISDN.
OGIS		Outgoing Identifier that is sent.
	YES	YES = The default. Use the CLID/CNI from the incoming ISDN/R2MFC trunk, or from the calling set. Prompted for outgoing trunks (i.e., if ICOG = OGT), and if the route type is R2MFC or ISDN.
CNTL	...	

LD 16 - Configure the CLID/CNI request options for an **R2MFC** route (**incoming and outgoing**) whose signaling is supported by a D-Channel (**ISL**.)

Prompt	**Response**	**Description**
REQ	CHG	Change the existing data.
TYPE	RDB	Route Data Block.
CUST	xx	Customer number.
ROUT	0-511	Route number.
TKTP	DID TIE	Trunk route type.
...		
ISDN	YES	ISDN.
- MODE	ISLD	ISL mode of operation.
...		

- IFC		Interface type.
	APAC	Asia Pacific.
	AXEA	Ericsson AXE-10 for Australia.
	AXES	Ericsson AXE-10 for Sweden.
	D70	Japan D70.
	D100	Meridian DMS-100.
	D250	Meridian DMS-250.
	ESIG	ETSI QSIG.
	ESS4	AT&T ESS#4.
	ESS5	AT&T ESS#5.
	EURO	EuroISDN.
	ISIG	ISO QSIG.
	NUME	Numeris for France.
	S100	Meridian SL-100.
	(SL1)	Meridian SL-1.
	SS12	SYS-12 for Norway.
	TCZ	NEAX-61 for New Zealand.
	1TR6	Germany 1TR6.
- - CNTY		Enter country pertaining to EuroISDN and Asia Pacific interface type (if IFC = EURO or APAC.)
	AUS	Austria.
	AUST	Australia.
	DEN	Denmark.
	DUT	Holland.
	EIR	Ireland.
	(ETSI)	ETSI basic protocol.
	FIN	Finland.
	FRA	France.
	GER	Germany.
	HKNG	Hong Kong.
	ITA	Italy.
	NOR	Norway.
	POR	Portugal.
	SING	Singapore.
	SWE	Sweden.
	SWI	Switzerland.
	TCNZ	New Zealand.
	THAI	Thailand.
...		
ICOG	IAO	Incoming and outgoing trunk route.
...		

MFC	YES	MFC.
MFCI	1-127	MFC Incoming table number; must be a non-zero value.
...		
MFCO	1-127	MFC outgoing table number; must be a non-zero value.
...		
SWP	...	
ICIS		Incoming Identifier that is sent.
	YES	YES = The default. Use the CLID/CNI from the incoming ISDN/R2MFC trunk. Prompted for incoming trunks (i.e., if ICOG = ICT), and if the route type is R2MFC or ISDN.
ICNP		Incoming Numbering Plan.
	(UKWN) PRV PUB	Unknown. Private Public Prompted if the route type is R2MFC and ICIS = YES.
ICNT		Incoming Numbering Type.
	(UKWN) INTL NTN LCL LOC CDP SPN	Unknown Number. International Number. National Number. Local Number. Location Number. Coordinated Dialing Plan. Special Number. Prompted if the route type is R2MFC and ICIS = YES.
ICPS		Incoming Presentation Status.
	YES	YES = Indicate the presentation status of the CLID. Prompted if the route type is R2MFC and ICIS = YES.
OGIS		Outgoing Identifier that is sent.
	YES	YES = The default. Use the CLID/CNI from the incoming ISDN/R2MFC trunk, or from the calling set. Prompted for outgoing trunks (i.e., if ICOG = OGT), and if the route type is R2MFC or ISDN.

Feature Operation

No specific operating procedures are required to use this feature.

R2 Multifrequency Compelled Signaling DID/DTMF DOD

Prior to Release 21, a Direct Inward Dialing (DID)/ Direct Outward Dialing (DOD) trunk using Multifrequency Compelled Signaling (MFC) inter-register signaling could only make incoming and outgoing calls using that type of signaling. Thus, if it was desired to configure a DID with R2 MFC signaling and a DOD with Dual Tone Multifrequency (DTMF) signaling, a minimum of two trunks were required.

The R2 MFC DID/DTMF DOD feature allows a single trunk to handle both incoming DID calls with International Telegraph and Telephone Consultative Committee (CCITT) R2 Multifrequency Compelled signaling, and to initiate outgoing DOD calls with DTMF register signaling. The end result is the ability for a customer with R2 MFC DIDs and DTMF DODs to provision fewer trunks.

This feature is required in countries where the Central Office/Public Exchange does not provide an MFC signaling capability on DOD trunks.

Operating parameters

This feature supports MFC signaling on DID and DTMF signaling on DOD with Multifrequency Mixed Signaling (MFX) Class of Service.

Tone and Digit Switch (TDS)/Extended Conference and TDS (XCT) cards are required to send DTMF tones.

MFC Sender/Receiver (S/R) cards are required to send and receive MFC tones.

This feature does not support any trunk types other than DID/DOD.

Analog and DTI2 trunks are only supported.

MFC Signaling for Socotel (MFE) and Multifrequency Signaling for KD3 (MFK) are not supported by the R2 MFC DID/DTMF DOD feature.

QPC327 (MFC) is required for Existing Peripheral Equipment (EPE); NT5K21AA or higher vintage (XMFC/XMFE) is required for Intelligent Peripheral Equipment (IPE).

Feature interactions

Set Based Administration - Automatic Trunk Installation

Since the R2 MFC DID/DTMF DOD feature introduces a new trunk based Class of Service, the set based administration procedures must be able to accept this Class of Service.

DTMF Signaling

Since the R2 MFC DID/DTMF DOD feature supports incoming MFC and outgoing DTMF signaling, the following interactions apply:

— Any feature interaction with outgoing Digitone signaling will apply to outgoing MFX calls; and

— Any feature using Digitone signaling on incoming trunks (DID/DOD) is not supported on MFX trunks.

MFC Signaling

Since the R2 MFC DID/DTMF DOD feature supports incoming MFC and outgoing DTMF signaling, the following interactions apply:

— Any feature interaction with incoming MFC signaling will apply to incoming MFX calls; and

— Any feature using MFC signaling on outgoing trunks (DID/DOD) is not supported on MFX trunks.

Semi-compelled MFC (SMFC) and Calling Name Identification (CNI)

Semi-compelled MFC and CNI on outgoing calls with MFX Class of Service are not supported. Incoming calls are not affected.

Feature packaging

The R2 MFC DID/DTMF DOD feature is included in Multifrequency Compelled Signaling (MFC) package 128.

Feature implementation

The following overlays should be used in the order given to set up the R2 MFC DID/DTMF DOD feature.

LD 13 – Configure MFC/XMFC units.

Prompt	Response	Description
REQ	NEW	Configure.
TYPE	MFC	MFC type.
TN	l s c u c u	Terminal Number. Terminal Number for the Option 11.

LD 94 – Configure MFC table for incoming trunks.

Prompt	Response	Description
REQ	NEW	Configure MFC table.
TYPE	R2MF	MFC table.
ICOG	ICT	Incoming table.
...		
MAXT	(1)-127	Maximum number of tables.
TBNO	1-127	MFC table number.

LD 16 – Configure Route Data Block for DID with MFC.

Prompt	Response	Description
REQ	NEW, CHG	Configure or change the Route Data Block.
TYPE	RDB	Route Data Block.
CUST	0-99	Customer Number.
ROUT	0-511	Route number.
TKTP	DID	DID trunk.
...		
ICOG	IAO	Incoming and outgoing trunk.
...		
MFC	YES	MFC signaling.
MFCI	1-127	MFC incoming table number.

LD 14 – Define DID trunk with MFX Class of Service.

Prompt	Response	Description
REQ	NEW, CHG.	Configure or change.
TYPE	DID	DID trunk.
TN	l s c u c u	Terminal Number. Terminal Number for the Option 11.
...		
CLS	MFX	Mixed signaling Class of Service.

Feature operation

No specific operating instructions are required to use this feature.

R2 Multifrequency Compelled Selective Route to Attendant

The R2 Multifrequency Compelled (MFC) Selective Route to Attendant signal prevents Meridian 1 stations from accepting collect (reverse-charged) calls from international operators by routing the incoming calls to the attendant. This is established by adding a new station Class of Service that will permit indicated stations to receive these calls, while routing others to the attendant.

Operating parameters

There are no operating parameters for this feature.

Feature interactions

There are no interactions with other features.

Feature packaging

Multifrequency Compelled Signaling (MFC) package 128.

Feature implementation

Refer to 553-2861-100 for implementation procedures.

Feature operation

No specific operating procedures are required to use this feature.

R2 Multifrequency Compelled Signaling to DPNSS1 Gateway

Prior to Release 20, there are a number of countries in Europe, Central America, and South America that require interworking to Other Equipment Manufacturer's PBXs in multivendor networking environments using Digital Private Network Signaling System One (DPNSS1). In these countries, the Central Office protocol is R2 Multifrequency Compelled Signaling (R2MFC) Direct Inward Dialing (DID) and in some cases R2MFC Direct Outward Dialing (DOD). In order for the Meridian 1 to operate in these environments, interworking of DPNSS1 and R2MFC trunks must be provided.

The R2MFC to DPNSS1 Gateway feature provides an interface between R2MFC DID/DOD trunks and DPNSS1 trunks, and can also provide Calling Number Identification (CNI) support for incoming calls.

In addition, the R2MFC to DPNSS1 Gateway feature introduces the following enhancements to the R2MFC incoming CNI request functionalities:

— The ability to request CNI for an incoming R2MFC call is possible immediately after a predetermined number of digits are received. The allowable range for this option is 0 to 7.

— The ability to request CNI for an incoming R2MFC call is possible immediately after an Electronic Switched Network (ESN) code is dialed. The ESN codes recognized for this purpose are Distant Steering Codes (DSC), Trunk Steering Codes (TSC), and NARS/BARS Access Codes (AC1, and AC2).

By using these CNI request options, CNI information will be available before the incoming R2MFC call is routed. This is necessary to provide CNI support for R2MFC DID to DPNSS1 gateway calls, but also provides an alternative for supporting CNI requests for incoming R2MFC calls in general. These options are applicable for incoming R2MFC DID/TIE calls.

Operating parameters

Meridian 1 DPNSS1 networks currently support only Coordinated Dialing Plan (CDP), Special Numbers (SPNs), and Basic Automatic Route Selection (BARS) (for outgoing calls), therefore the R2MFC to DPNSS1 feature does not support Universal Dialing Plans (UDPs).

For R2MFC DID calls routing to DPNSS1 trunks, the option Accept CNI (ACNI) is provided in the DPNSS1 route data block to identify if CNI information should be passed at the gateway. If the ACNI option is set to YES, the far end PBX must accept the Originating Line Identity (OLI) string for Called/Calling Line Category (CLC) Public Switched Telephone Network (PSTN) calls in the Initial Service Request Message (ISRM).

Two additional options are provided for requesting CNI before the R2MFC DID call is even routed as previously described. Using one of these options is the only mechanism that will provide CNI for an R2MFC-DPNSS1 gateway call (unless the call is the result of call redirection). If the interfacing Central Office cannot support such options, both of these options have to be disabled and therefore no CNI will be available for the R2MFC-DPNSS1 gateway call.

CNI is for R2MFC trunks tandeming to DPNSS1 trunks only. For calls originating from DPNSS1 trunks, and tandeming to an outgoing R2MFC trunk, the CNI information in the DPNSS1 call is not used. Existing methods of generating the CNI locally at the gateway node are used.

Interworking of R2MFC TIE trunks and DPNSS1 trunks is not supported for this feature.

Interworking between MFE DID/DOD trunks and DPNSS1 trunks is not supported by this feature. Interworking between MFE KD3 DID/DOD trunks and DPNSS1 trunks is also not supported by this feature.

External Operator Features and Toll Call Identification (from China Number 1 signaling) are not supported by this feature.

No new hardware is required for this feature.

Feature interactions

CDR Calling Line ID for DPNSS1

At the terminating PBX, the OLI string for the R2MFC DID originated call may contain the CNI information. The Release 20 CDR Enhancement feature automatically prints the contents of the OLI string in the CLID field of the CDR. Hence, the CNI information will be made available on the CDR (i.e., it will be printed in the CLID field).

DPNSS1 Basic Call

The R2MFC Gateway feature introduces a change in the content sent in the Initial Service Request Message (ISRM) when the originator of a DPNSS1 call is an R2MFC DID trunk. If CNI information has been obtained from the incoming trunk, the CNI digits are sent as an OLI string in the IRSM. In that case, the Trunk Identity (TID) string is not sent. If no CNI information is available from the originating trunk, the TID string is sent. The transport of the CNI digits as an OLI is controlled by the Accept CNI (ACNI) option on the outgoing DPNSS1 route.

At the terminating node of the DPNSS1 call, an OLI string instead of a TID string may now be received for calls that originate from trunks which are not using ISDN or Integrated Digital Access (IDA) signaling. The information available for call display is now different. If the terminating node cannot handle receiving an OLI from such trunk calls, the ACNI option should be set to NO on the outgoing DPNSS1 route at that gateway.

The Step Back on Congestion (SBOC) option programmed for an outgoing DPNSS1 route is ignored for R2MFC-DPNSS1 gateway calls. Specifically, if an R2MFC DID to DPNSS1 gateway call receives a Clear Request Message (CRM) due to congestion, the call is not rerouted (i.e., does not search for an idle trunk based on the next entry in the Route List Block), regardless of whether or not the SBOC option is programmed. Instead, the call is treated as a congested call and intercept is provided if necessary. If the SBOC option is allowed, there is a potential problem in the gateway signaling because the next outgoing route may not be a DPNSS1 route.

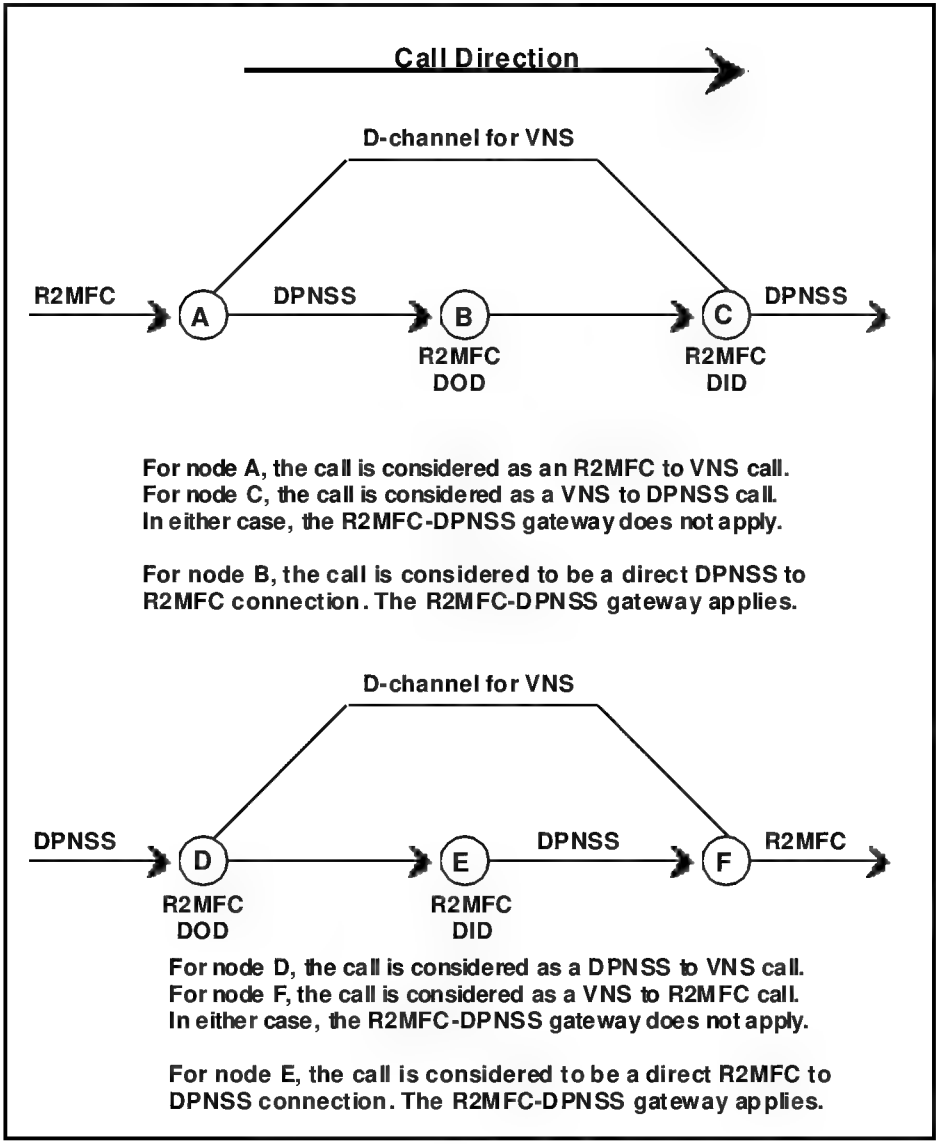
Digital Private Network Signaling System (DPNSS1)/Digital Access Signaling System (DASS2) Uniform Dialing Plan (UDP) Interworking

The R2MFC to DPNSS1 Gateway is supported with UDP numbers at the same level as it is supported with CDP numbers.

Virtual Network Services (VNS)

If the call on the DPNSS1 (or R2MFC) trunk is tandeming to the R2MFC or (DPNSS1) trunk on a Virtual Network Services (VNS) call, the R2MFC to DPNSS1 Gateway feature does not apply. If a DPNSS1/R2MFC tandem is encountered during the routing of a VNS call, the R2MFC to DPNSS1 Gateway feature applies. The following figure illustrates how the R2MFC-DPNSS1 gateway may apply to a VNS call.

Figure 1
Applicability of R2MFC-DPNSS1 Gateway to VNS Calls


Call Direction
D-channel for VNS
R2MFC
A
DPNSS
B
DPNSS
C
R2MFC
DOD
R2MFC
DID
For node A, the call is considered as an R2MFC to VNS call.
For node C, the call is considered as a VNS to DPNSS call.
In either case, the R2MFC-DPNSS gateway does not apply.
For node B, the call is considered to be a direct DPNSS to
R2MFC connection. The R2MFC-DPNSS gateway applies.
D-channel for VNS
DPNSS
D
E
DPNSS
F
R2MFC
R2MFC
DOD
R2MFC
DID
For node D, the call is considered as a DPNSS to VNS call.
For node F, the call is considered as a VNS to R2MFC call.
In either case, the R2MFC-DPNSS gateway does not apply.
For node E, the call is considered to be a direct R2MFC to
DPNSS connection. The R2MFC-DPNSS gateway applies.

Feature packaging

No new software option package has been introduced with this feature; however, the following packages are required at the gateway Meridian 1 to provide the basic DPNSS1 and R2MFC signaling functionalities: Integrated Digital Access (IDA) package 122; Digital Private Network Signaling System 1 (DPNSS1) package 123; and Multifrequency Compelled Signaling (MFC) package 128.

For network numbering the following packages are recommended: Coordinated Dialing Plan (CDP) package 59; Basic Automatic Route Selection (BARS) package 57; Pretranslation (PXLT) package 92; Incoming Digit Conversion (IDC) package 113; and Flexible Numbering Plan (FNP) package 160.

The CNI request enhancements are packaged under the existing Multifrequency Compelled Signaling (MFC) package 128.

Feature implementation

LD 16 – Two new prompts (NCNI and CNIE) are introduced in the route data block for defining CNI request options for the R2MFC route.

Prompt	Response	Description
REQ	NEW, CHG	New, or change.
TYPE	RDB	Route data block.
...		
TKTP	DID	Direct Inward Dialing trunk data block.
...		
MFC	YES	
...		

NCNI	(0)-7	Request CNI after the defined number of digits are received. If NCNI = 0, the CNI request does not depend on the number of digits received. If NCNI is defined to be greater than the number of digits required for routing the call, the CNI will not be requested but the call will be routed.
CNIE	(NO), YES	Request CNI after an ESN code is dialed. This R2MFC route requests/(does not request) CNI after an ESN code is dialed. The ESN code could be a Distant Steering Code (DSC), a Trunk Steering Code (TSC), the NARS Access Code 1 (AC1) or the NARS Access Code 2 (AC2). NCNI and CNIE are prompted when the following occurs: the MFC package is equipped TKTP = DID or TIE MFC = R2MF, and the MFC signaling table is defined on the route. If NCNI > 0 and CNIE = YES, CNI is requested when either one of the conditions is first met.
CNIT	(NO), YES	Request CNI only if the dialed station has Malicious Call Trace Allowed (MCTA) Class of Service.

LD 16 – A new prompt (ACNI) is introduced in the route data block for defining whether the DPNSS1 route supports R2MFC CNI.

Prompt	**Response**	**Description**
REQ	NEW, CHG	New, or change.
TYPE	RDB	Route data block.
...		
TKTP	IDA	Integrated Digital Access.

SIGL	DPN, APNS	DPN for DPNSS1 signaling. APNS for APNSS signaling.
...		
TTBL	...	
ACNI	(NO), YES	Accept Call Number Identification (CNI). This DPNSS1 route allows/(does not allow) R2MFC CNI sent as an Originating Line Identity (OLI) string in the initial service request message (ISRM). This is prompted when the following occurs: the IDA package is equipped the MFC package is equipped TKTP = IDA, and SIGL = DPN/APNS.

Feature operation

No specific operating procedures are required to use this feature.

Semi-compelled MFC and Calling Number Identification Changes

These are enhancements to the R2 Multifrequency Compelled Signaling (MFC) feature.

Semi-compelled MFC provides Semi-compelled MFC signaling on trunks; this capability is typically desirable in markets where there is a high rate of satellite transmission. To reduce signaling times, MFC backward signals (A and B) are sent for 150 milliseconds instead of being compelled (i.e., having to wait for forward signals (I and II) to terminate).

The Calling Number Identification (CNI) enhancement provides the option of ending CNI transmission when a NEXT signal is received, and switching to called number transmission.

Both options are configured in LD 94.

Operating parameters

The MFC software pack QPC327 or the XMFC/XFME software pack NT5K21AA must be equipped.

Incoming trunks must support MFC register signaling.

Feature interactions

There are no interactions with other features.

Feature packaging

Multifrequency Compelled Signaling (MFC) package 128.

Feature implementation

LD 94 – Allow or deny Semi-compelled MFC and Calling Number Identification transmission:

Prompt	Response	Description
...		
EECD	...	
SMFC	(NO), YES	Enter YES for Semi-compelled MFC. If NO is entered, backward signals are stopped when the forward signal is recognized as having stopped.
SCNT	(NO), YES	Enter YES to stop CNI transmission at the reception of a NEXT signal, and to switch to called number transmission. If NO is entered, CNI transmission continues at the reception of a NEXT signal.

Feature operation

No specific operating procedures are required to use this feature.

Taiwan R1 Modified Signaling

The Taiwan R1 Modified Signaling feature supports Taiwan R1 Modified Signaling (TWR1 MS) over Taiwan R1 Direct Inward Dial (DID) or Direct Outward Dial (DOD) DTI trunks. With TWR1 MS, the capability to carry Calling Line Identification (CLID) across a Meridian 1 network is supported for local and national calls. Please note that, in a networking environment, the CLID is supported only for TWR1 calls that are tandemed over MCDN, ISDN, or QSIG trunks. A discussion on how CLID is processed for TWR1 MS is found in the section "CLID processing" on page 166.

The Taiwan R1 Modified Signaling feature may operate in a standalone or network environment. In a standalone environment, the Meridian 1 connects directly to a Taiwan Public Exchange over Taiwan R1 Modified Signaling trunks.

In a networking environment, the tandem Meridian 1 connects to a Taiwan Public Exchange over Taiwan R1 or Taiwan ISDN trunks, and to one or more other Meridian 1 Private Exchange(s) over MCDN, QSIG, Dual Tone Multi Frequency (DTMF), or Dial Pulse (DP) trunks. Connectivity to the Private Exchange over Taiwan R1 Modified Signaling, Digital Private Networking Signaling System No. 1 (DPNSS1), or Level 2 Multi Frequency Compelled Signaling (R2 MFC) trunks is not supported.

Types of supported TWR1 protocols

The Taiwan R1 Modified Signaling feature supports the following call signaling protocols, for national and international calls:

— incoming local or national call protocol

Note: Incoming international calls are accepted and treated by the Meridian 1 using the national call protocol.

— outgoing local or national call protocol

— outgoing international call protocol

The section "How the Meridian 1 handles the supported types of TWR1 protocols" on page 170 describes the call processing that takes place by the Meridian 1 to handle the supported TWR1 protocols. But first, we discuss how the system processes CLID information for the Taiwan R1 Modified Signaling feature, for incoming and outgoing calls.

CLID processing

Incoming CLID

An incoming TWR1 route on the Meridian 1 may be configured with or without the CLID option. If a Central Office expects to receive the 210 - 220ms CLID request wink signal from the Answer signal, then the TW_INC_CLID prompt in LD16 may be set to YES for the incoming route. If the prompt is set to YES, once the called number is received from the Central Office, the Meridian 1 will send out a CLID request wink to request CLID digits. The called number received is not processed until after the CLID information has been received. When the TW_INC_CLID prompt is set to YES, if CLID digits are not received within a specified time, the call is completed with CLID failure treatment, as follows:

— A series of seven '-' (dashes) is shown on the displays of sets that have displays.

— The CLID field in the CDR ticket for the call is left blank.

— No CLID is made available to the Application Module Link (AML), Application Processor Link (APL), and the High Speed Link (HSL).

For a Central Office that does not expect to receive the CLID request wink signal, the TW_INC_CLID prompt must be set to NO for the incoming route. CLID failure treatment is given to such calls because no CLID is received. In this case, the called number received is processed as soon as it is received.

The CLID information received is made available to existing features that use CLID such as an answering digital terminal's display and such applications as Meridian Link, Customer Controlled Routing, Meridian Mail, Meridian MAX, and ACD MAX using the Application Module Link (AML), Application Processor Link (APL), and High Speed Link (HSL).

For a Taiwan R1 initiated tandem call to an outgoing MCDN, QSIG, or Taiwan ISDN trunk, the CLID that is received with the incoming call may be sent out over the MCDN, QSIG, or Taiwan ISDN trunk to identify the caller. If the outgoing trunk is either a DTMF or DP trunk, no CLID is sent over the outgoing trunk.

Outgoing CLID

The following section discusses how the Meridian 1 handles outgoing CLID information, for a station (set or attendant) and a trunk.

Station (set or attendant console) initiated call

On a standalone PBX, whenever a call is made from a set or an attendant console, the CLID is generated to identify the caller. If the response to the CLID prompt for a customer in LD 15 is YES, the existing customer CLID database is used. This function allows the system administrator to control the CLID contents using the CLID entry configuration in LD 15. If the response to the CLID prompt is NO, there is no CLID composed for calls originated by sets belonging to that customer.

If the response to the existing CLID prompt for a customer in LD 15 is YES, a CLID table can then be defined for the customer. The size of the CLID table is service changeable, ranging from 0 to a maximum of 4000 entries, with a default of 256 entries. Each entry in the table is a CLID entry. Each CLID entry contains the codes for:

— Home National Code (HNTN). This is the national number, which is the area code for Taiwan.

— Home Local Code (HLCL). This is the home local code, which is the office code for Taiwan.

— Direct Inward Dialing DN (DIDN). If DIDN is set to YES, then HLCL is suffixed with the DN of the active key. If DIDN is set to NO, then HLCL is not suffixed with anything. If DIDN is set to SRCH (search), then starting from key 0, all keys are searched until the key for which DIDN is set to YES is found. Then the DN of that key is used.

A CLID entry can be assigned to a DN of an analog (500/2500) set or an ISDN BRI set, and to a DN key for a Meridian 1 proprietary set. For a station set initiated Taiwan call, the CLID is composed based on the CLID entry that the originating DN uses. If the user does not select a CLID entry number, CLID entry 0 is used as the default. During set administration, there is no cross-checking of the CLID entry associated with the set against the CLID entry in the customer data block. If a CLID entry is removed from the CLID table and the CLID entry is still assigned to a DN key, CLID is not generated and CLID failure indication is sent out.

For an attendant console initiated Taiwan call, the CLID composition is based on CLID entry 0. If CLID entry 0 is not defined, CLID is not generated and CLID failure indication is sent out.

Once the CLID is composed, it is sent to the far-end. If the originating terminal has requested privacy as per the Calling Party Privacy (CPP) or Display Party Denied (DPD) features, then CLID is sent out with the CLIR indicator. Otherwise the CLIP indicator is sent.

Trunk initiated tandem call

For an MCDN, ISDN, or QSIG trunk initiated tandem call, the Meridian 1 does not compose any CLID for the incoming trunk. If CLID is available, and presentation is allowed, the CLID that is passed in by the incoming trunk may be directly passed on to the TWR1 trunk to identify the caller. The CLIP indicator is sent out in this case. If CLID is available, but the caller has requested privacy, CLID is sent out with the CLIR indicator.

If, no CLID is available, as is the case for a DTMF or DP trunk initiated tandem call, the CLID failure indicator is sent to the outgoing trunk.

The possibility of an invalid CLID composition

The Taiwan R1 Modified Signaling feature builds the CLID from the CLID entry in LD15. It is up to the craftsperson to ensure that the right digits are entered. There is no validation of digits in the CLID entries of the CLID table. Therefore, it is possible that the CLID built from the CLID entries may be an invalid number or not match the number of the dialing station.

TWR1 Calling Party Privacy CLID

The following sections discuss how the Meridian 1 handles incoming CLID information with CLIR indicator, and how and when the Meridian 1 sends out CLID information with CLIR indicator.

Incoming CLID digits with CLIR indicator

If an incoming Taiwan R1 call with a CLIR indicator is received by the Meridian 1 in a standalone scenario, seven '-' (dashes) will be displayed on the answering set or ACD agent set, and CLID digits are not sent to such applications as Meridian Mail, Meridian Link, Meridian CCR, and Meridian MAX. However, the CLID digits are sent to CDR.

If the Meridian 1 is a network PBX, the call with the CLIR indicator will be tandemed to an outgoing MCDN, QSIG, or Taiwan ISDN trunk with the CLID Restriction indicator. If the call is tandemed to an outgoing DTMF or DP trunk, no CLID is sent.

Outgoing CLID digits with CLIR indicator

For outgoing calls from a standalone Meridian 1 PBX, if the caller requests privacy as per the existing Calling Party Privacy (CPP) and Display Party Denied (DPD) features, CLID is sent out with the CLIR indicator.

If the Meridian 1 is a network PBX, if the incoming MCDN, QSIG, or Taiwan ISDN call contains the "CLID Presentation Restricted" indicator, the call is tandemed to Taiwan R1 trunks with the CLIR indicator. In case of tandem calls from a DTMF or DP trunk, the CLID failure indicator is sent.

How the Meridian 1 handles the supported types of TWR1 protocols

Incoming local and national call processing

The Central Office seizes a TWR1 trunk, and sends a called number to the Meridian 1. If the TW_INC_CLID is set to NO, then the call terminates as soon as the called number is received. The call is given the following CLID failure treatment:

— A series of seven '-' (dashes) is shown on the displays of sets that have displays.

— The CLID field in the CDR ticket for the call is left blank.

— No CLID is made available to the Application Module Link (AML), Application Processor Link (APL), and the High Speed Link (HSL).

If the TW_INC_CLID is set to YES, on receiving the called number, the Meridian 1 sends a request wink signal to the Central Office, to request the calling number and CLID information. The CO sends the calling number in MF tones. The calling number includes the Information digit "I", where "I" may be one of the following digit values:

— 0 or 1, which signifies that CLID is available with Calling Line Identification Presentation (CLIP) allowed. This is the normal CLID delivery.

— 2, which signifies that CLID is not available. The call receives the CLID call failure treatment described above.

— 3, which signifies that CLID is available with Calling Line Identification Restriction (CLIR). The call receives the following treatment:

- A series of seven '-' (dashes) is shown on the displays of sets that have displays.
- The CLID field in the CDR ticket for the call is appropriately filled.
- No CLID is made available to the Application Module Link (AML), Application Processor Link (APL), and the High Speed Link (HSL).

Outgoing local and national call processing

For outgoing calls, Electronic Switched Network (ESN) and Trunk Access Code (ACOD) dialing are supported. To handle the inconsistent dialing patterns for outgoing calls, the Flexible Numbering (FNP) package 160 has to be equipped on the Meridian 1 PBX. For ESN dialing, the call is terminated as soon as soon as the Flexible Length (FLEN) value is reached for the dialed Special Number (SPN). For ACOD dialing, the call is terminated after a time of five seconds elapses from when a last digit, or '#' is immediately dialed.

When a called number is composed using ESN dialing, the Meridian 1 collects the dialed digits, as determined by the Flexible Numbering Plan configuration, and seizes an outgoing TWR1 trunk to the far-end Central Office. The Meridian 1 sends the called number digit string to the CO, and awaits for the calling number and CLID information request wink signal. If this signal is not received within a specified period of time, as defined by the Taiwan Time Out timer[1] (TTO), the calling number is not sent.

On receiving the CLID request wink signal from the Central Office, the Meridian 1 sends the calling number in MF tones. The calling number includes the Information digit "I", where "I" may be one of the following digit values:

— 0 , which signifies that CLID is available with Calling Line Identification Presentation (CLIP) allowed. A value of '0' is sent to the far-end CO if the originating set has not requested privacy as per the Calling Party Privacy (CPP) or Display Party Denied (DPD) features.

1. The TTO is a programmable waiting timer for the CLID request wink signal on outgoing trunks. It can be defined in LD 16 to be in a range of 128ms to 7seconds, with a default value of 128ms. The TTO has been implemented for the following reasons. For users who don't expect CLID request wink from CO, the called party would hear the ring back tone from the terminating end only after seven seconds, which is too long. For users who do expect CLID request wink from the CO, the programmable timer provides a flexibility to configure the proper timers according to the different situations of different COs.

The default value of TTO is 128ms, which is defined for the users who don't expect CLID request wink from the CO. However, for the users who do expect CLID request wink from the CO, they should configure the TTO timer to a suitable value. The value may differ depending on different COs, because different CO may have different delay when they send the wink signal. Users may change the value through testing.

— 2, which signifies that CLID is not available.

Note: For outgoing calls, as long as a CLID has been configured for the originating set, CLID information will always be sent. It is up to the far-end CO to handle the CLID accordingly.

— 3, which signifies that CLID is available with Calling Line Identification Restriction (CLIR). The CLIR indicator is sent to the far-end CO to request calling party privacy, if one of the following conditions exists:

- For a call originating from a set or attendant, the originator requests calling party privacy as defined by the Calling Party Privacy (CPP), Display Party Denied (DPD), Calling Party Privacy Override (CPPO), or BRI set privacy feature.
- For tandem calls over MCDN, ISDN, or QSIG trunks, the tandem call contains a Presentation Restriction indicator.

Outgoing international call processing

Taiwan R1 Modified Signaling uses two stage outpulsing of the called party number for outgoing international calls. The first stage includes sending the international call access code (002) to the CO, and the second stage includes sending the country code and the called number to the CO. The second stage of outpulsing is started by the Meridian 1 when the "second stage outpulsing request" wink is received from the CO.

Note: There is no CLID sent for outgoing international calls.

Both ESN dialing and ACOD dialing are supported for making TWR1 outgoing international calls. If using ESN dialing, it is the responsibility of the craftsperson to configure a Special Number (SPN) of "002", which is the Taiwan international call access code. The SPN 002 is configured using LD 90. Also in LD 90, an appropriate Flexible Length (FLEN) of at least 16 digits should be defined, and the Inhibit Time Out Handler (ITOH) should be set to a value of "NO". Refer to the implementation procedure on page 200.

Taiwan numbering plans

This section describes the called party and calling party numbering plan format used by the Taiwan Public Switched Telephone Network (PSTN) system. The numbering plan is variable, having different digit string lengths for large cities and small cities.

For outgoing calls, Electronic Switched Network (ESN) and Trunk Access Code (ACOD) dialing are supported. To handle the inconsistent dialing patterns for outgoing calls, the Flexible Numbering (FNP) package 160 has to be equipped on the Meridian 1 PBX, if ESN dialing is used. With FNP equipped, the call is terminated as soon as soon as the Flexible Length (FLEN) value is reached for the dialed Special Number (SPN). For ACOD dialing, the call is terminated after a time of five seconds elapses from when a last digit is dialed, or if '#' is dialed immediately.

> ***Note:*** Large cities in Taiwan will soon be upgrading to the new dialing plan, indicated by "Large cities (future)."

Table 12 represent the dialing plans used by the Taiwan PSTN. The sections that follow then show the numbering plans, according to incoming and outgoing call formats.

Table 12
Taiwan PSTN numbering plan formats

	Area Code	Office Code	Subscriber Number
Large cities (future)	A	+BCDD'	+XXXX
Large cities (current)	A	+BCD	+XXXX
Small cities	AB	+CD	+XXXX

The letters represent the variable digits allowed in each position.

— The first digit of the area code can be 2-8.

— The first digit of the office code can be 2-9.

— All other letters imply that the digits can be 0-9.

— The service code numbers can be three digits, such as 10X, 11X, and 16X.

Incoming call formats - Local/National and International[1] calls

This section shows the numbering plan formats for the supported incoming call protocols, namely Local/National calls. Please note that the Meridian 1 treats incoming International calls using the same protocol as for incoming Local/National calls. For this reason, there is reference to International calls in the tables that follow.

Incoming National and International Called Party Number format

Table 13 shows the format for a called party number of a Local/National or International incoming call.

Table 13
Called party number format for Local/National and International incoming calls

Call type	Called Area	Called Party Number format expected by the Meridian 1
Local/National, International*	Large city (future)	A+BCDD'+XXXX or BCDD'+XXXX
	Large city (current)	A+BCD+XXXX or BCD+XXXX
	Small city	AB+CD+XXXX or CD+XXXX
* For international calls, the Meridian 1 uses the same protocol as for national calls.		

Note: There is no CLID sent for International incoming calls.

1. For incoming International calls, the Meridian 1 treats them using the same incoming call protocol as for incoming National calls.

Incoming Local/National Calling Party Number format

Table 14 shows the Calling Party composition for a Local/National incoming call.

Note: For International incoming calls, no CLID is available from the far end, as per the Taiwan R1 Modified Signaling protocol.

Table 14
Calling party composition for Local/National incoming calls

Call type	Calling Area	Calling Party Number format expected by the Meridian 1
Local/National	Large city (future)	A+BCDD'+XXXX
	Large city (current)	A+BCD+XXXX
	Small city	AB+CD+XXXX
	Global System for Mobile communication (GSM)	93X+XXXXXX
	Advanced Mobile Phone Service (AMPS)	90+XXXX

Outgoing call formats - Local/National, and International calls

This section shows the numbering plan formats for the supported outgoing call protocols, namely Local/National, and International calls.

Outgoing Local/National, International Called Party Number format

Table 15 shows the format for a called party number of a Local/National and International outgoing call.

Table 15
Called party format for Local/National and International outgoing calls

Call type	Called Area	Called Party Number format sent from the Meridian 1
Service call	All	1XX
Local	Large city (future)	BCDD'+XXXX
	Large city (current)	BCD+XXXX
	Small city	CD+XXXX
National	Large city (future)	A+BCDD'+XXXX
	Large city (current)	A+BCD+XXXX
	Small city	AB+CD+XXXX
	Global System for Mobile communication (GSM)	93X+XXXXXX
	Advanced Mobile Phone Service (AMPS)	90+XXXX
	Pager	AB+XXXXXX or ABB'+XXXXXX
International	All	002+Country Code+Area Code+Subscriber Code

Outgoing Local/National Calling Party Number format

Table 16 shows the Calling Party composition for a Local and National outgoing call.

Note: There is no CLID sent for outgoing International calls.

Table 16
Calling Party composition for Local/National outgoing calls

Call type	Calling Area	Calling Party Number format sent from the Meridian 1
Local or National	Large city (future)	A+BCDD'+XXXX or BCDD'+XXXX
	Large city (current)	A+BCD+XXXX or BCD+XXXX
	Small city	AB+CD+XXXX or CD+XXXX

Operating parameters

The Taiwan R1 trunk is a one-way trunk, being either outgoing only or incoming only (as configured in LD 16 in response to the ICOG prompt).

Taiwan R1 trunks use Multi Frequency (MF) signaling only. Dual Tone Multi Frequency (DTMF) signaling and Dial Pulse (DP) signaling are not supported.

Taiwan R1 trunks support Loop Dial Repeating Signaling (LDR) only.

Only DID/DOD and DTI Taiwan R1 trunks are supported for this feature.

Both ESN and ACOD dialing are supported for making TWR1 outgoing international calls. If using ESN dialing is used for making outgoing international calls, it is the responsibility of the craftsperson to configure a Special Number (SPN) of "002", which is the Taiwan international call access code, in LD 90.

The Taiwan R1 Modified Signaling feature builds the CLID based on the CLID entry defined in LD 15. Since there is no system validation of the CLID digits entered by the craftsperson for the CLID table, it is possible that the CLID that is built from the CLID entries may be invalid. It is the responsibility of the craftsperson to ensure integrity.

The CLID digit string received is not validated by the system software. For a standalone PBX, the CLID digits are displayed on the answering terminal exactly as they are received, without any manipulation. The same information is made available to other applications via the AML, APL and HSL. For a network PBX, the CLID digits are passed on to the outgoing MCDN, QSIG, Taiwan R1 or Taiwan ISDN trunk.

All timers, other than the Disconnect Supervision Timer (DSI), the Seizure Supervision timer (SST) and the Taiwan Time Out timer (TTO), are hard-coded and not programmable. The DSI and SST are existing timers that are programmable via LD 16. The TTO is a new timer that has been introduced to provide flexibility in handling delays pertaining to outgoing trunk calls. TTO is also programmable using LD 16.

Hardware requirements

For large systems (Meridian 1 Options 51C, 61C, 81, 81C), the 1.5 Mbit NT5D12xx Dual-port DTI/PRI (DDP) card is required, operating in DTI mode.

For the small system Meridian 1 Option 11C, the 1.5 Mbit NTAK09xx DTI/PRI card is required, operating in DTI mode.

> ***Note:*** xx = For both large and small systems, the card vintage is to be determined.

These cards send the timed wink (modified wink start) required for the Taiwan R1 Modified Signaling operation.

Feature interactions

Automatic Call Distribution

For incoming calls over Taiwan R1 trunks to an ACD set, the CLID information of a calling party is displayed on the ACD set. If CLID is not available, or if Calling Line Identification Restriction (CLIR) applies, seven "-" (dashes) are displayed on the ACD set instead.

BRI sets

ISDN BRI sets, and their associated privacy functionality, are supported on the Taiwan R1 Modified Signaling feature. When the Caller Number Presentation Denied capability is configured on an ISDN BRI set that originates a call over a Taiwan R1 trunk, the Calling Line Identification Restriction (CLIR) indicator in the TWR1 protocol is sent out with the CLID.

Call Hold

When an incoming call over a Taiwan R1 trunk is taken off hold on a set, the CLID display remains on that set.

Call Forward (all types), Hunt (including Network Hunt)

Consider the scenario where Calling Line Identification Restriction (CLIR) applies to incoming calls over Taiwan R1 trunks. These calls are forwarded to an MCDN, QSIG, or Taiwan ISDN trunk as a result of treatment by all types of Call Forward, and by Hunt (including Network Hunt).

In this scenario, the Privacy Indicator of the call is sent to the outgoing trunk to inhibit the display of the calling party number.

In the case where an incoming call with CLIR originates from an MCDN, QSIG, or Taiwan ISDN trunk, and is forwarded or hunted to a Taiwan R1 trunk, the CLID is sent with the CLIR indicator.

If an incoming trunk call is forwarded or hunted to a Taiwan R1 trunk, and Calling Party Privacy has been activated for the forwarding DN, the CLIR indicator is sent over the Taiwan R1 trunk to inhibit the display of the number of the forwarding set.

Call Transfer

In the case where an incoming call with CLIR originates from an MCDN, QSIG, or Taiwan ISDN trunk, and is transferred over a Taiwan R1 trunk, the outgoing CLID is sent with the CLIR indicator.

In the case where a call comes in over a Taiwan R1 trunk, and the CLIR indicator is received with the CLID, and the call is transferred, then the Presentation Restricted indicator is set for the outgoing call to inhibit the display of the number of the transferring set.

If an incoming call over a Dual Tone Multi Frequency (DTMF) or Dial Pulse (DP) trunk is transferred to a Taiwan R1 trunk, or if an incoming call over a Taiwan R1 trunk is transferred to a DTMF or DP trunk, no CLID is sent over the outgoing trunk.

Call Pickup/Call Pickup Network Wide

If a call with the Calling Line ID Presentation (CLIP) indicator comes in over a Taiwan R1 trunk, and is picked up locally or remotely, the CLID of the incoming call is displayed on the set performing the call pickup.

If the incoming call would have had the Calling Line Identification Restriction (CLIR) indicator instead of CLIP, then seven "-" (dashes) would have been displayed on the set performing the call pickup.

Calling Party Privacy

If the Calling Party Privacy Flexible Feature Code is dialed, or if Calling Party Number and Name Blocking Allowed (CLBA) Class of Service is activated, for a call going out over a Taiwan R1 trunk, then the CLIR indicator is sent with the CLID over the outgoing trunk. Both of these actions block the CLID of the originating set from being displayed on the terminating set.

Calling Party Privacy Override

For an outgoing call over a Taiwan R1 trunk, if the Calling Party Privacy Override Flexible Feature Code is dialed, the Calling Line ID Presentation (CLIP) indicator in the TWR1 protocol is sent out over the Taiwan R1 trunk.

Custom Local Area Signaling Services sets

If the CLID delivery on a Custom Local Area Signaling Services (CLASS) set is restricted, the information that is displayed depends on the type of vendor CLASS set being used.

Conference

The Conference feature is supported over Taiwan R1 trunks. If an incoming or originating local call is conferenced over an outgoing Taiwan R1 trunk, the CLID is passed over the Taiwan R1 trunk.

If an incoming call over a Dual Tone Multi Frequency (DTMF) or Dial Pulse (DP) trunk is conferenced over an outgoing Taiwan R1 trunk, no CLID is sent over the outgoing Taiwan R1 trunk. The same applies if an incoming Taiwan R1 call is conferenced over an outgoing DTMF or DP trunk.

If the set originating the conference has requested Calling Party Privacy by dialing the Flexible Feature Code, or if Calling Party Number and Name blocking (CLBA) Class of Service is activated for the set, then the CLIR indicator is sent with the CLID over the outgoing Taiwan R1 trunk.

Display Calling Party Denied

If a local set with a Class of Service of Display on other Set Denied (DDGD) originates a call over an outgoing Taiwan R1 trunk, then the Presentation Indicator field for the call is set to Presentation Restricted.

For incoming Taiwan R1 calls, there is no interaction with the Display Calling Party Denied feature.

Emergency Services Access

ESA calls may be made over Taiwan R1 trunks. The rules that apply for the CLID composition for ESA calls are in effect.

Flexible Numbering Plan

If ESN dialing is used, the Flexible Numbering Plan is required to accommodate Taiwan's variable numbering plan.

Incoming Digit Conversion

The incoming digits received from the Central Office via Taiwan R1 trunks can be converted to unrelated extension numbers within the Meridian 1.

Incoming Trunk Programmable CLID

For calls coming in over Taiwan R1 trunks to a network PBX that has Incoming Trunk Programmable CLID configured, then the billing number and not the incoming CLID is passed over the outgoing Taiwan R1 trunk connected to the Central Office.

Network Message Services

An call incoming over a Taiwan R1 trunk to a Message Center attendant will not display the CLID if the Calling Line Identification Restriction (CLIR) is sent with the CLID.

ACD MAX

The Taiwan R1 Modified Signaling feature provides the proper CLID information to the ACD MAX operation, via the High Speed Link (HSL) messages. If the Calling Line Identification Restriction (CLIR) is sent with the CLID, the CLID information is not included in the HSL messages sent to ACD MAX.

Application Module Base (AM Base)

The Taiwan R1 Modified Signaling feature provides the proper CLID information to the Application Module Base (AM Base), via the Application Module Link (AML) messages. If the Calling Line Identification Restriction (CLIR) is sent with the CLID, the CLID information is not included in the AML messages sent to the AM Base.

Customer Controlled Routing

The Taiwan R1 Modified Signaling feature provides the proper CLID information to the Customer Controlled Routing (CCR) operation, via the Application Module Link (AML) messages. If the Calling Line Identification Restriction (CLIR) is sent with the CLID, the CLID information is not included in the AML messages sent to CCR.

Call Detail Recording

The Taiwan R1 Modified Signaling feature provides the proper CLID information to the CDR operation. If the Calling Line Identification Restriction (CLIR) is sent with the CLID, the CLID information is still included in the CDR ticket.

Meridian IVR

The Taiwan R1 Modified Signaling feature provides the proper CLID information to the Meridian IVR operation, via the Application Module Link (AML) messages. If the Calling Line Identification Restriction (CLIR) is sent with the CLID, the CLID information is not included in the AML messages sent to Meridian IVR.

Meridian Link

The Taiwan R1 Modified Signaling feature provides the proper CLID information to the Meridian Link operation, via the Application Module Link (AML) messages. If the Calling Line Identification Restriction (CLIR) is sent with the CLID, the CLID information is not included in the AML messages sent to Meridian Link.

Meridian Mail

The Taiwan R1 Modified Signaling feature provides the proper CLID information to the Meridian Link operation, via the Application Module Link (AML) messages.

If the Calling Line Identification Restriction (CLIR) is sent with the CLID for an incoming call over a Taiwan R1 trunk to a Meridian Mail set, the CLID information is not sent to Meridian Mail to be recorded. When the called party retrieves the message, no CLID information will be played. The Call Sender feature cannot be initiated by the called party, since the CLID was not recorded.

Meridian MAX

The Taiwan R1 Modified Signaling feature provides the proper CLID information to the Meridian MAX operation, via the Application Module Link (AML) messages. If the Calling Line Identification Restriction (CLIR) is sent with the CLID, the CLID information is not included in the AML messages sent to Meridian MAX.

Meridian VISIT

The Taiwan R1 Modified Signaling feature provides the proper CLID information to the Meridian VISIT Messenger, via the Application Module Link (AML) messages. If the Calling Line Identification Restriction (CLIR) is sent with the CLID, the CLID information is not included in the AML messages sent to the Meridian Messenger.

Feature packaging

The following packages are required for the Taiwan R1 Modified Signaling feature:

— Automatic Number Identification (ANI) package 12

— Taiwan R1 (TWR1) package 347

— If ESN dialing is used, the Flexible Numbering Plan (FNP) package 160, to support Taiwan's variable numbering plan

Feature implementation

This section contains the overlay procedures required to configure the Taiwan R1 Modified Signaling feature on a Meridian 1 PBX.

The required procedures are as follows:

— Configure the digital Taiwan R1 trunks, and configure a digital loop for the XCT (Extended Conference/Tone and Digit Switch/Multifrequency Sender) card (required for outgoing calls), using LD 17.

— Configure a Multifrequency Receiver (MFR), using LD 13 (required for incoming calls).

— Configure a customer CLID database (required for outgoing calls), using LD 15.

— Configure a Taiwan R1 route, using LD 16.

— Configure Taiwan R1 trunks, using LD 14.

— Configure a CLID entry for analog (500/2500 type) sets (required for outgoing calls), using LD 10.

— Configure a CLID entry for Meridian 1 proprietary sets (required for outgoing calls), using LD 11.

— Configure a Taiwan Numbering Plan:

- Configure a Digit Manipulation Index, using LD 86.
- Configure a Route List Index, using LD 86.
- Configure ESN data, using LD 86.
- Configure Special Number Translation data, using LD 90.
- Define the Special Number (002) for outgoing Taiwan international calls, and configure the appropriate SPN and ITOH values, using LD 90.

LD 17 - Configure the digital Taiwan R1 trunks.

Configure a digital loop for the XCT (Extended Conference/Tone and Digit Switch/Multifrequency Sender) card (required for outgoing calls).

Prompt	Response	Description
REQ	CHG	Change existing data.
TYPE	CEQU	Common Equipment Information.
...		
- XCT	0, 2, 4,...158	Loop number (even-numbered) for the Extended Conference/TDS/MFS card.
...		
- DLOP	ll dd ff	Digital trunk loop options. ll = loop number dd = number of voice or data calls ff = frame format
- MODE	TRK	Mode of operation is digital trunk.
...		

LD 13 – Configure a Multifrequency Receiver (MFR) (required for incoming calls).

Prompt	Response	Description
REQ	NEW CHG	Add new data. Change existing data.
TYPE	MFR	Multifrequency Receiver.
TN	l s c u	Terminal Number for the MFR, for Options 51C-81/81C. l = loop. s = shelf. c = card. u = unit.
	c u	Terminal Number for Option 11C. c = card. u = unit.
...		

LD 15 – Configure the customer CLID database (required for outgoing calls, if ICOG = OGT in LD 16).

Prompt	Response	Description
REQ:	NEW CHG	Add new data Change or delete existing data.
TYPE:	NET	Networking data (if REQ = CHG only.)
CUST	xx	Customer number. xx = 0-99 for Options 51C-81/81C xx = 0-31 for Option 11C.
...		
- CLID	(NO) YES	CLID option. YES = configure a CLID table for the customer. NO = do not configure a CLID table. In this case, the remaining prompts are not generated, and no CLID is sent for the customer.
- - SIZE	0-(256)-4000	The maximum number of CLID entries needed for a customer. If REQ = NEW, you may select the default value (256) by entering <CR> in response to this prompt. It is advised that you not define a size much larger than actually needed. This entry may be increased or decreased as required.
- - INTL	0-9999 X	Country code, for international number. Enter X to delete the digits.
- - ENTRY	aaaa Xaaaa Xaaaa Xbbbb	CLID entry to be configured. CLID entry to be deleted. Range of CLID entries to be deleted, aaaa and bbbb must be a value between 0 and (SIZE-1).
	<CR>	The ENTRY prompt is repeated until <CR> is entered as a response.

		If REQ = NEW, only one new entry may be created. The entry will be saved to system memory when the configuration for the entire overlay is completed. If REQ = CHG, as many entries as needed may be created, changed or deleted. The action for the entry will be saved to system memory after the CLID entry has been completely configured, that is, after the LSC prompt has been answered. If a new CLID entry is created, or an existing CLID entry is changed, the message "ENTRY aaaa SAVED" is displayed after the LSC prompt. If a CLID entry or CLID entries is/are deleted, the message "ENTRY aaaa DELETED" or "ENTRIES aaaa-bbbb DELETED" is displayed after the LSC prompt.
- - - HNTN	0-999999 X	National code for home national number (1-6 digits). Enter X to delete the digits.
- - - HLCL	0-999..9 X	Local code for home local number or Listed Directory Number (1-12 digits). Enter X to delete the digits.
- - - DIDN		How to use the DN as a DID when constructing a CLID national or local number.
	(YES) NO SRCH	The CLID is constructed using the digits defined in HLCL followed by the DN of the active key. Construct the CLID using the digits defined in HLCL. Search on the set, from key 0 - upwards, to find a CLID entry which has the DIDN set to YES. Use the found CLID to construct the local number.
- - - HLOC	0-9999999 X	Home location code (ESN), 1-7 digits. Enter X to delete the digits.
- - - LSC	0-9999999 X	Local steering code, 1-7 digits. Enter X to delete the digits.
ENTRY aaaa SAVED ENTRY aaaa DELETED ENTRIES aaaa-bbbb DELETED		Displayed message. Refer to Note 3 for the ENTRY prompt.

LD 16 - Configure a Taiwan R1 route, in the Route Data Block.

Prompt	Response	Description
REQ	NEW CHG	Add new data. Change existing data.
TYPE	RDB	Route Data Block.
CUST	xx	Customer number, as already configured in LD 15. xx = 0-99 for Options 51C-81/81C xx = 0-31 for Option 11C.
ROUT	0 - 511 0-127	Route Number for Options 51C-81/81C. Route Number for Option 11C.
TKTP		Trunk type.
	DID	Taiwan R1 trunks must be Direct Inward Dialing (DID).
TW_ROUTE	YES	Configure a Taiwan R1 route. This prompt is generated only if TKTP = DID. It is autoprinted if REQ = CHG.
...		
DTRK	YES	Taiwan R1 routes are digital. The prompt and response are auto-printed, if TW_ROUTE = YES.
DGTP	DTI	Taiwan R1 route trunks are digital. The prompt and response are auto-printed, if TW_ROUTE = YES.
...		
ICOG	ICT OGT	Taiwan R1 trunk is incoming only. Taiwan R1 trunk is outgoing only. If TW_ROUTE = YES, the incoming and outgoing trunk (IAO) option is not allowed.
TW_INC_CLID	(NO) YES	YES = the Meridian 1 sends the CLID request wink signal after the called number has been received. NO = The call is terminated as soon as the called number is received. This prompt appears only if ICOG = ICT.

...		
INST	xx...x	Number of digits to be inserted before the leading digit. (Required for incoming calls). xx...x = 1-99999999.
CNTL	YES	Configure the control timers.
- TIMR	TTO (128)-7040	Configure the Taiwan Time Out value, in milliseconds. This is valid for outgoing trunks, that is, if ICOG = OGT.
- TIMR	SST 3-(5)-15	Configure the Seizure Supervision Timer, in seconds.

LD 14 - Configure Taiwan R1 trunks.

Prompt	Response	Description
REQ	NEW CHG	Add new data. Change existing data.
TYPE		Trunk type.
	DID	Taiwan R1 trunks must be Direct Inward Dialing (DID).
CUST	xx	Customer number, as already configured in LD 15. xx = 0-99 for Options 51C-81/81C xx = 0-31 for Option 11C.
RTMB	0-511 1-510 0-127 1-510	Route number and member number, for Options 51C-81/81C. For Option 11C.
...		
SIGL	LDR	Level 3 signaling is Loop Dial Repeating for Taiwan R1 trunks. The prompt and response are autoprinted.
...		
STRI	MWNK	Start arrangement for incoming Taiwan R1 trunks is Modified Wink. The prompt and response are autoprinted if ICOG = ICT (incoming trunks only) in LD 16.
STRO	MWNK	Start arrangement for outgoing Taiwan R1 trunks is Modified Wink. The prompt and response are autoprinted if ICOG = OGT (outgoing trunks only) in LD 16.
...		
CLS	MFR	Class of Service for Taiwan M1 trunks must be Multifrequency Receive.
...		

LD 10 – Configure the CLID entry for analog (500/2500 type) sets (required for outgoing calls, if ICOG = OGT in LD 16).

Prompt	Response	Description
REQ:	NEW CHG	Add new data. Change existing data.
TYPE:	500	500 set.
TN	 l s c u c u	Terminal Number. l = loop, s = shelf, c = card, u = unit for Options 51C-81/81C c = card, u = unit for Option 11C.
DES	d...d	Office Data Administration System (ODAS) Station Designator of 1-6 alphanumeric characters.
CUST	xx	Customer number as defined in LD 15. xx = 0-99 for Options 51C - 81C. xx = 0-31 for Option 11C.
...		
DIG	xx yy	Dial Intercom group number and member number.
DN	xxxx (0)-N	DN and CLID entry. N = CLID SIZE-1 (SIZE defined in LD 15).
...		

LD 11 - Define the CLID entry for DN keys for Meridian 1 proprietary sets (required for outgoing calls, if ICOG = OGT in LD 16).

Note: When assigning a CLID entry to an ACD set, you cannot use the same position ID already on the set. The set must be first outted, or the ACD key must be nulled and then rebuilt with the table entry number.

Prompt	Response	Description
REQ:	NEW CHG	Add new data. Change existing data.
TYPE:	xxxx	Type of telephone set.
TN	 l s c u c u	Terminal Number. l = loop, s = shelf, c = card, u= unit for Options 51C-81/81C c = card, u = unit for Option 11C.
DES	d...d	Office Data Administration System (ODAS) Station Designator of 1-6 alphanumeric characters.
CUST	xx	Customer number as defined in LD 15. xx = 0-99 for Options 51C - 81C. xx = 0-31 for Option 11C.
...		
KEY	 xx MCN yyyy (0)-N/D xx MCR yyyy (0)-N/D xx PVN yyyy (0)-N/D xx PVR yyyy (0)-N/D xx SCN yyyy (0)-N/D xx SCR yyyy (0)-N/D	Telephone function key assignments. xx = key number. MCN = Multiple Call Non-ringing key. MCR = Multiple Call Ringing key. PVN = Private Line Non-Ringing key PVR = Private Line Ringing key SCN = Single Call Non-ringing key. SCR = Single Call Ringing key. yyyy = DN. (0)-N = CLID entry, with N = CLID SIZE-1 (SIZE defined in LD 15). D = CLID entry. Search for a CLID entry from key 0 upwards, to find a DN key. The found CLID is used as the CLID entry for the active DN key.

KEY	xx HOT D dd yyy...y zzzz m (0)-N/D	Two-way Hotline Direct key, where: xx = key number. dd = number of digits dialed. yyy...y = target number (terminating DN, maximum of 31 digits). zzzz = two-way hotline DN. m = one of the following Terminating Modes: H = Hotline (default) N = Non-ringing R = Ringing V = Voice (0)-N = CLID entry, with N = CLID SIZE-1 (SIZE defined in LD 15). D = CLID entry. Search for a CLID entry from key 0 upwards, to find a DN key. The found CLID is used as the CLID entry for the active DN key.
KEY	xx HOT L bbb zzzz (0)-N/D	Two-way Hotline List key, where: xx = key number. bbb = Hot Line List entry (0-999). zzzz = two-way hotline DN. (0)-N = CLID entry, with N = CLID SIZE-1 (SIZE defined in LD 15). D = CLID entry. Search for a CLID entry from key 0 upwards, to find a DN key. The found CLID is used as the CLID entry for the active DN key.
KEY	xx ACD aaaa 0-N/D bbbb	ACD key, where: xx = key number. aaaa = ACD DN or Message Center DN. 0-N = CLID entry, with N = CLID SIZE-1 (SIZE defined in LD 15). D = CLID entry. Search for a CLID entry from key 0 upwards, to find a DN key. The found CLID is used as the CLID entry for the active DN key. bbbb = ACD agent's position ID. Please refer to the note at the top of the overlay table, on page 196, that pertains to assigning a CLID entry to an ACD set.

Configure a Taiwan Numbering Plan.

LD 86 – Configure a Digit Manipulation Index (required for incoming calls).

Prompt	Response	Description
REQ	NEW	Add data.
CUST	xx	Customer number, as already configured in LD 15. xx = 0-99 for Options 51C-81/81C xx = 0-31 for Option 11C.
FEAT	DGT	Digit Manipulation Index.
DMI	(0)-999	Digit Manipulation Index number.
DEL	(0)-19	Number of leading digits to be deleted.
...		

LD 86 – Configure a Route List Index.

Prompt	Response	Description
REQ	NEW	Add data.
CUST	xx	Customer number, as already configured in LD 15. xx = 0-99 for Options 51C-81/81C xx = 0-31 for Option 11C.
FEAT	RLB	Route List Index.
RLI	xxx	Route List Index to be accessed.
ENTR	xxx	Entry Number for Route List.
LTER	(NO) YES	Local Termination entry (required for incoming calls). Enter NO.
ROUT	0 - 511 0-127	Route Number for Options 51C-81/81C. Route Number for Option 11C.
DMI	(0)-999	Digit Manipulation Index number, as defined in previous step (required for incoming calls).
...		

LD 86 – Configure ESN data.

Prompt	Response	Description
REQ	NEW	Add data.
CUST	xx	Customer number, as already configured in LD 15. xx = 0-99 for Options 51C-81/81C xx = 0-31 for Option 11C.
FEAT	ESN	ESN data.
...		
AC2	xx	NARS Access Code 2.
...		

LD 90 – Configure Special Number Translation.

Prompt	Response	Description
REQ	NEW	Add data.
CUST	xx	Customer number, as already configured in LD 15. xx = 0-99 for Options 51C-81/81C xx = 0-31 for Option 11C.
FEAT	NET	Network Translation Table.
TRAN	aaa	Translator. aaa = AC1, AC2, or SUM. Enter AC2.
TYPE	SPN	Type is Special Number Translation.
SPN	x...x	Special Number Translation.
- FLEN	(0)-24	Flexible Length (required for outgoing calls).
- ITOH	NO	Do not inhibit Time-out Handler (required for outgoing calls).
- RLI	xxx	Route List Index.

LD 90 - Define the Special Number (002) for outgoing Taiwan international calls, and configure the appropriate SPN and ITOH values.

Prompt	Response	Description
REQ	NEW	Add data.
CUST	xx	Customer number, as already configured in LD 15. xx = 0-99 for Options 51C-81/81C xx = 0-31 for Option 11C.
FEAT	NET	Network Translation Table.
TRAN	 aaa 	Translator. aaa = AC1, AC2, or SUM. Enter AC2.
TYPE	SPN	Type is Special Number Translation.
SPN	002	Define 002 as the Special Number for outgoing Taiwan R1 international calls.
- FLEN	(0)-24	Flexible Length (required for outgoing calls). Enter a value of at least 16.
- ITOH	NO	Do not inhibit Time-out Handler (required for outgoing calls).
- RLI	xxx	Route List Index.

Maintenance and diagnostics guidelines

Call Trace (LD 80)

If a Taiwan R1 call is traced using LD 80, the CLID information is displayed in addition to the regular call information. For an incoming Taiwan R1 call, the display is as follows:

```
TWR1 call (ORIG)
Calling No = 4159405336
```

For an outgoing Taiwan R1 call, the CLID information is displayed only if the call is not yet established. The display is as follows:

```
TWR1 call (TERM)
Calling No = 4159405336
```

If an invalid digit (valid digits being KP or digits 0-9) is stored in the CLID field for an incoming or outgoing Taiwan R1 call, message TRA0319 is printed.

TDS, MFR and dual-port DTI/PRI cards

Existing maintenance and diagnostic procedures for the TDS, MFR and trunk cards are supported.

Maintenance and diagnostics procedures for the TDS card involve the following:

— enabling and disabling the TDS loop and obtaining the TDS loop status using LD 34 and LD 46

— self-testing the TDS loop using LD 34 and LD 46

Maintenance and diagnostics procedures for the MFR card involve the following:

— enabling and disabling the MFR card and obtaining the MFR card status using LD 32 and LD 34

— self-testing the MFR card using LD 32 and LD 34

— monitoring the MFR using LD 77

Maintenance and diagnostics procedures for the dual-port DTI/PRI cards (NT5D12xx for Options 51C, 61C, 81, 81C, and NTAK09xx for Option 11C) involve the following:

— enabling and disabling the dual-port DTI/PRI card and obtaining the card status using LD 60

— self-testing the dual-port DTI/PRI card using LD 60

Feature operation

No operating procedures are required to use this feature.

Multifrequency Signaling for Socotel

Description

Multifrequency Signaling for Socotel is referred to as MFE, package number 135. It consists of Multifrequency Sender/Receiver circuit cards and optional software.

MFE is a signaling protocol that allows a Meridian 1 to communicate with a Public Exchange (Central Office) using Socotel signaling on DID/DOD trunks. A private network can be throughout in a public network. The DOD numbering plan is divided in two parts: calls to other installations which use a 6-digit plan and calls to special services which use a 2-digit plan. The difference is made by analyzing the first digit. The values of the first digit for special services are programmable.

Note 1: A tandem call to MFE outgoing trunk is supported, providing there are no access restrictions. The digits are outpulsed as soon as they are received.

Note 2: MFE is not supported on ISDN PR, but MFE can tandem in either direction.

Note 3: A call on a Electronic Switched Network (ESN) is able to access a MFE outgoing trunk.

Limitation

The digits are outpulsed as soon as the customer dials them. If a very short time between two digits is required, this could create a problem but using the optional feature Delay Digit Outpulsing (DDO) overcomes that problem. Call set-up is delayed by the length of a timer.

Hardware

Physical

The MFE Sender/Receiver (S/R) circuitry is packaged as a printed circuit (NTD9464) of the dimensions shown in Table 17.

Table 17
MFE S/R circuit card dimensions

Length	12.5 in (320mm)
Width	10.0 in (254mm)
Depth	1.25 in (32mm)

The LED mounted on the faceplate indicates the status of the circuit card (ON when disabled).

Either μ-law or A-law is available as determined by a jumper on the circuit card (factory installed).

Functions

The M/F S/R card provides the signaling interface between the Central Processing Unit (CPU) and the DID/DOD trunk. The appropriate trunk circuit card will handle the line signaling on the trunk, whereas the MFE S/R will handle the multifrequency signaling according to the Socotel signaling specification. The signaling consists of code signals composed of two out of five frequencies (700, 900, 1100, 1300, 1500 Hz) or a control signal (acknowledge) composed of a 'control' frequency of 1900 Hz. It is capable of transmitting and receiving the Pulse Code Modulation (PCM) multifrequencies simultaneously on two channels.

Location

The MFE S/R mounts in any of the printed circuit slots of the peripheral equipment shelf.

Environmental considerations

The NTD9464 MFE S/R circuit card must not be subject to an environment outside the constraints shown in Table 18.

Table 18
MFE S/R circuit card environmental requirements

	Ambient temperature	Relative humidity
Non-operating	0 to + 70° C	up to 90%
Operating	0 to + 35° C	20 to 80%

Signaling

Line signaling

Line signaling must be used to seize the equipment, supervise the call and release the call. It does not affect MFE register signaling but is necessary to complete a call.

MFE signaling is independent from the line signaling. Any line signaling method (2 wire E & M, 4-wire E & M, DX2. DX4, LOOP, 2-Mb/s and 1.5-Mb/s DTI) can be used with MFE.

Any trunk type between the Meridian 1 and a Central Office may be used as far as the Central Office is able to support MFE on this trunk.

Register signaling

MFE register signaling is used to communicate between a Meridian 1 and the Public Exchange. For DID, register signaling commences once the incoming trunk has been seized, seizure acknowledgement has been returned, if required, and an MFE S/R has been attached. The first signal (SEND) comes from the incoming side of the call requesting digits from the Public Exchange. For DOD, register signaling commences once the outgoing trunk has been seized, seizure acknowledgement has been received if required and an MFE S/R has been attached. The MFE signaling commences with the reception of a signal from the Public Exchange.

Signals are divided into two main groups, forward signals and backward signals. With DID, forward signals are those received from the Public Exchange, and backward signals are those sent to the Public Exchange. With DOD, forward signals are those sent to the Public Exchange, and backward signals are those received from the Public Exchange. The signals are sent over a speech path and are combinations of two out of five frequencies. Refer to Table 3-1. Forward and backward signals are comprised of the same frequencies.

Table 19
MFE frequency combinations

Signal number	Frequencies
1	700 + 900
2	700 + 1100
3	900 + 1100
4	700 + 1300
5	900 + 1300
6	1100 + 1300
7	700 + 1500
8	900 + 1500
9	1100 + 1500
10	1300 + 1500

Each signal is acknowledged by the control frequency which is set to 1900 Hz and cannot be varied. (There are six possible frequencies: MFE uses only five.) It is the only signal which is not a combination of frequencies. This control frequency indicates to the opposite side of the call that the signal has been received and its transmission can cease. The level at which each frequency is sent is determined in the trunk data, LD 14. Frequencies of 700 and 900 Hz are sent at -10.5 dBm base level, 1100 and 1300 Hz at a level one dBm higher and 1500 Hz at a level still one dBm higher. The level for the control frequency (-7.0 dBm) is also determined here.

A signal corresponds to a certain combination of frequencies. However, signals are assigned to have certain functions determined by tables in data administration LD 94. In this way the meaning of each forward signal from the Public Exchange can be deciphered and frequency combinations corresponding to the desired functions can be sent as backward signals.

Table 20
MFE signals

Group 1	Signal number	Function mnemonic	Description
Forward Level 1	1-9	DGT1-DGT9	digit 1 to digit 9
	10	DGT0	digit 0
		ACOC	access code for a call to other installation
		ACSS	access code for a call to special services
Backward Level 1		SACD	send access code and digits
	2	SEND	send digits
	3	COMP	address complete, change to level 2
		TRAN	transit connection
		FAIL	failure, new attempt
		CONG	congestion
Backward Level 2	1	IDLE	station idle, charge call
	3	BUSY	station busy
	3	CONG	access denied or lack of resources
	3	OUTT	out of order
	3	VACC	vacant DN

Forward signals

The forward Level 1 signals are sent by the Public Exchange to the Meridian 1 and DID/DOD trunks.

Note: Timers MFI and MFF, and other MFE table information are set in LD 16 (Trunk Route).

(a) DGT
These signals represent the ten digits (DGT1 to DGT0).

(b) ACOC
It is sent after the SACD signal has been received. It is followed by the first four digits of the called number.

(c) ACSS
It is sent after the SACD signal has been received. It is followed by the two first digits of the called number.

Backward signals

These are signals sent by the Meridian 1 to the Public Exchange. Refer to Table 3-2. The function of each signal is determined in LD94. The corresponding signal to be sent is retrieved from the MFE table in that program. One signal may be used for more than one function.

There are two levels of backward signals. The first is called Level 1 signals and is used to request information. The second level is called Level 2 signals which are used to indicate the state of the called party at the Meridian 1. Level 2 signals are always preceded by a Level 1 signal whose function is COMP.

Backward Level 1 functions

The Level 1 signals are as follows:

(a) SACD
It is the first signal received after the seizure of the trunk. After receiving this signal, the access code is sent (DGT1 or DGT5) followed by four or two signals for the first digits depending on the access code.

(b) SEND
A signal with this function is used to indicate to the Public Exchange that seizure was successful and transmission of digits should begin. Four or five group I signals, determined by the DGTS prompt in LD96, will be expected.

(c) COMP
This function indicates that the received digits have been translated into a DN, valid or invalid, and that the next signal sent will be a backward Level 2 signal indicating the state of the called DN. The Level 2 signal will be sent immediately after this signal has been properly acknowledged.

(d) TRAN
Its reception means that the Public Exchange had made a cut-through for the two installations. After the reception of this signal, the meaning of the SEND is changed (the last four digits will be sent).

(e) FAIL
This signal occurs when there is a failure. Make a new attempt.

(f) CONG
A congestion signal corresponding to this function is sent to the Public Exchange when one of the units involved in the connection has failed. It is only used if there is no Level 2 defined.

Background Level 2 functions

Level 2 signals indicate the state of the called DN. Different functions can be assigned to have the same signal. For example, the same signal can be used to represent busy and congestion.

To return corresponding tones with signals, the answer to the SGL prompt in LD16 (Trunk Route) must have been NO. In this case both the signal and the tone are indicative of the state of the called DN. Otherwise, if the reply to the SGL prompt was YES, an IDLE Level 2 signal is always returned and the tone alone indicates the called party status.

Vacant DN (VACC) and Out of Service (OUTT) signals are only used if the intercept treatment specified in LD15 (Customer Data) is other than recorded announcement or attendant. If the intercept is to the attendant or a recorded announcement then the signal returned will depend on their status.

The Level 2 signals are as follows:

(a) IDLE
The called party is idle and the call must be charged. Ringback tone is returned if SGL is NO. Otherwise the tone corresponding to the called party status is sent.

(b) BUSY
The called party is off-hook and busy tone is returned. If a busy trunk group is encountered then busy tone or overflow tone, as indicated by the customer intercept table, is returned.

(c) CONG
The unit at the receiving end of the call is 'access denied' or 'termination is unsuccessful' and the tone specified by the intercept table is returned.

(d) OUTT
The called extension is out of order and the tone specified by the intercept table is returned.

(e) VACC
The called extension does not exist and the tone specified by the intercept table is returned.

Hardware description

Sender/Receiver circuit cards

The MFC feature requires that the Meridian 1 be equipped with QPC327 MFC Sender/Receiver (MFC S/R) circuit cards. The MFC S/R printed circuit card provides the signaling interface between the Central Processing Unit (CPU) and the MFC Trunk. The card transmits and receives PCM Forward and Backward signals simultaneously on two channels. Each channel operates like a typical peripheral source with a unique time slot for sending and receiving signals.

The MFC S/R circuit cards operate in systems using either A-Law or μ-Law companding (selected by a jumper plug on the circuit card).

Description

The MFC S/R circuitry is housed in a standard peripheral card of the dimensions shown in Table 21.

Table 21
MFC S/R circuit card dimensions

Height	12.50 inches	(317.50 mm)
Depth	10.00 inches	(254.00 mm)
Thickness	0.25 inches	(31.75 mm)

The LED mounted on the faceplate indicates the status of the card (ON when disabled).

Location

The MFC S/R circuit cards fit into any peripheral circuit card positions on a peripheral equipment (PE) shelf.

Quantities required

Refer to Part 4 of this document for engineering information and formulas for determining the required number of MFC S/R cards (the required minimum number is always 2).

Power requirements

The MFC S/R card is powered from the -48 V dc regulated supply available on the backplane of the PE shelf. At -48 V the power requirements are:

Typical	0.28 A
Maximum	0.46 A

A switching power regulator converts this -48 to +5 V for use by the circuitry on the card. The power regulator sits on a single-sided "daughter" board mounted above the double-sided main board of the card.

Operating environment

The environmental conditions shown in Table 22 must be met to permit proper functioning of the MFC S/R Circuit card:

Table 22
MFC S/R circuit card environmental requirements

Card location	Ambient temperature	Relative humidity
Card in isolation	0 to 70° C 32 to 158° F	up to 90%
Card in system	0 to 35° C 32 to 95° F	20 to 80%

Components

The MFC S/R circuit card (Figure 2) has five main components:

1 Peripheral Shelf Interface

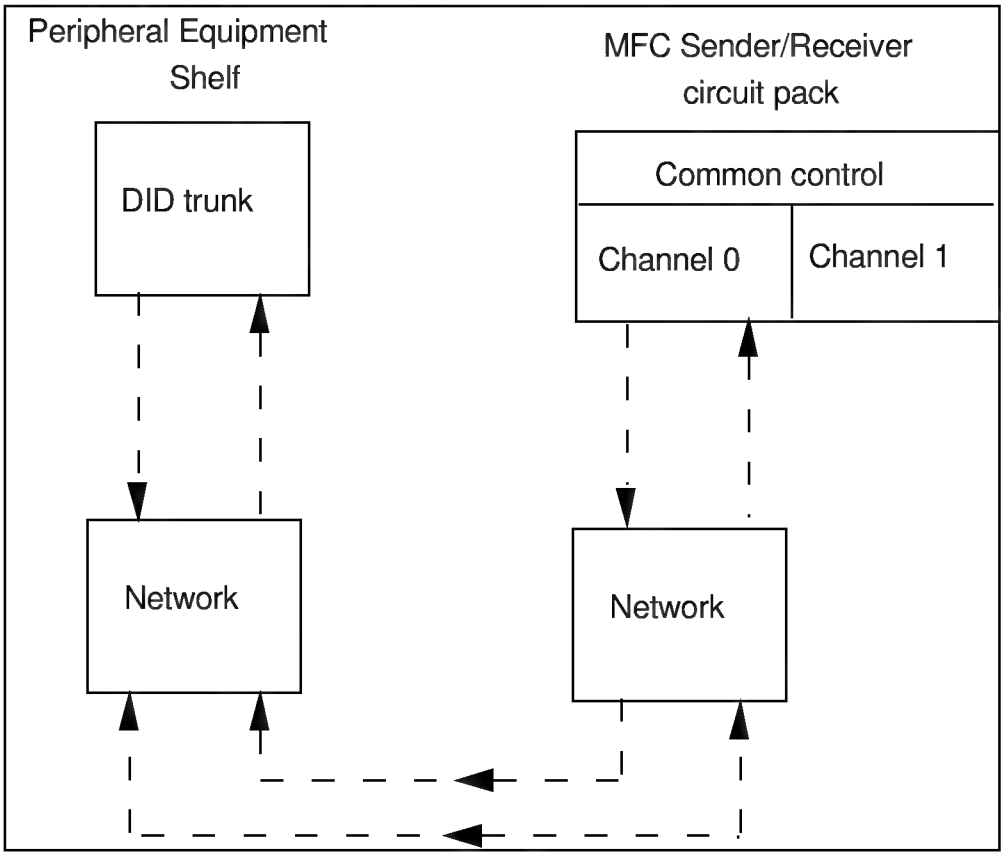
2 Digital Sender

3 Digital Receiver

4 Microprocessor Subsystem

5 Control Sequencer.

Figure 2
Block diagram of MFC S/R circuit card



Peripheral shelf interface

A buffer in the peripheral shelf interface converts the 0 to 10V backplane signals of the peripheral shelf into the standard TTL signals used on the MFC S/R circuit card. The peripheral shelf interface controls:

— MFC signaling (PCM data)

— CPU signaling

— I/O synchronizing circuitry.

Digital sender

This circuit in the MFC S/R card can generate any of the 30 PCM tone pairs required for Forward (15 tone pairs) and Backward (15 tone pairs) signaling on each of the two MFC channels. The CPU specifies one out of eight output signal levels for each channel. The level specified is 0 through 7 for signals of -8, -11, -12, -13, -14, -15, -16, and -35dBm respectively. Table 23 gives the sender performance specifications.

Digital receiver

The MFC receiver processes incoming PCM tones on both channels through one of two groups of eight digital filters. The receiver accumulates the magnitude of the output signal from each filter and feeds this information to the MFC microprocessor once every 8ms. Table 24 gives the receiver performance specifications.

Microprocessor subsystem

This subsystem performs the following functions:

— receives commands and "digits to send" from the CPU

— drives the Sender

— receives signal level data from the digital receiver and processes this data to decode the digit received

— executes part of the MFC protocol, such as requests for sending the next digit

— provides self-test capability.

Control Sequencer

This sequencer generates timing and control signals for the circuitry on the MFC S/R card. The sequencer consists of counters which feed PROM for decoding timing control signals. The counters are synchronized by the PCM data samples every 125 ms. A sample counter drives the Sender and generates the Microprocessor interrupt signals.

Table 23
Performance specifications for MFC sender

Description	Specifications
Forward frequencies (originating)	1380, 1500, 1620, 1740, 1860, 1980 Hz
Backward frequencies (terminating)	1140, 1020, 900, 780, 660, 540 Hz
Frequency tolerance	±0.5 Hz from Nominal
Power level of each non-modulated frequency (at the sending point)	Selectable (1 out of 8 for signals of -8, -11, -12, -13, -14, -15, -16, and -35 dBm)
Level difference between two signaling frequencies	<0.5 dB
Harmonic distortion and intermodulation	37 dB below the level of one signaling frequency
Time interval between the start of sending of each of the two frequencies	125 µs
Time interval between the cessation of sending of each of the two frequencies	125 µs

Table 24
Performance Specification for MFC receive

Description	Specification	Condition
Input sensitivity		
— must accept	-5 to -35dBm	±10Hz of nominal
— must reject	-42dBm/tone	Single sine wave or a combination of two sine waves in 300–3400Hz band
Bandwidth		
— must accept	fc ±10Hz	
— must reject	fc - 60Hz>f>fc + 60Hz	
Amplitude Twist		
— must accept	difference of 5dB	Between adjacent frequency
— must accept	difference of 7dB	Between nonadjacent frequency
— must reject	difference of 20dB	Between any two frequencies
Operating Time	<32ms	Tests, Type A and B
Releasing Time	<32ms	Tests, Type A and B
Tone Interruption causing no release	<8ms	Receiver on, while tone missing
Longest Input Tone to be ignored by receiver	<8ms	Combination of frequency each at -5 dBm
Noise Rejection	S/N>18dB	No degradation with white noise of 300 – 3400 Hz
	S/N<17dB	Disturbance in the backward band while operating in DID mode OR Disturbance in the forward band while operating in DOD mode.

Engineering information

Reference list

The following are the references in this section:

- *X11 Administration (553-3001-311)*
- *X11 Maintenance (553-3001-511)*

This chapter provides information about:

— MFC provisioning

— MFC service change

— MFC maintenance

MFC provisioning

Use the following procedure to determine the required number of MFC S/R circuit cards.

ABSBH MFC channel traffic.

Calculate (a) the ABSBH for MFC calls and (b) the ABSBH MFC Channel Traffic in CCS as follows:

(a) ABSBH for MFC = (a x 100)/b

where:

a = MFC trunk traffic (in CCS)

b = call holding time (in seconds).

Note: Assume call holding time to be 135s if unknown.

(b) ABSBH MFC Channel Traffic = (a x b)/100

where:

a = ABSBH for MFC

b = MFC channel holding time (in seconds).

Note: Assume MFC channel holding time, if unknown, to be:

2.33 s for 4-digit MFC calling

1.7518 s for 3-digit MFC calling.

Delay grade of service

Use Table 6 to choose delay grade of service of MFC channels that meet response requirements of the Central Office (CO) or Public Service Telephone Network (PSTN).

Table 25
Delay Grade of service for MFC provisioning, P (Delay > 0.5 s)

CO/PE response requirement	% Delay over 0.5 s
fast response	0.5
medium response	1.5
slow response	3.0

ABSBH Voice Loop traffic

Calculate the ABSBH voice loop traffic in CCS as follows:

— ABSBH Voice Loop Traffic = a/b

where:

a = total network traffic

b = total number of voice loops

Note: If voice loop traffic is greater than 600 CCS, then all voice loops must be unloaded to 600 CCS ABSBH.

Refer to Table 26 or 27 for the following conditions:

— Table 26 if voice loop traffic calculated above is in range 0–500 CCS.

— Table 27 if voice loop traffic calculated above is in range 501–600 CCS.

Table 26
Number of MFC cards required — loop traffic, 0–500 CCS

Percent delay over 0.5 second			No. of MFC channels	No. of MFC cards
0.5%	1.5%	3.0%		
20	30	38	4	2
52	67	80	6	3
90	110	125	8	4
131	155	173	10	5
175	203	224	12	6
221	253	277	14	7
269	304	331	16	8
318	357	385	18	9
369	410	441	20	10
420	465	498	22	11
473	520	555	24	12
525	576	613	26	13
580	633	672	28	14
634	690	731	30	15

Table 27
Number of MFC cards required — loop traffic, 501–600 CCS

Percent delay over 0.5 second			No. of MFC	No. of MFC
0.5%	1.5%	3.0%	channels	cards
---	10	322	4	2
40	62	76	6	3
81	105	122	8	4
123	151	171	10	5
167	200	222	12	6
213	250	274	14	7
261	301	328	16	8
310	353	383	18	9
360	406	439	20	10
411	461	495	22	11
463	516	553	24	12
516	572	611	26	13
570	629	669	28	14
624	686	728	30	15

Number of MFC Cards

Using Table 26 or 27, determine the number of MFC cards required.

— Select left-hand column headed by delay grade of service chosen per Table 25.

— Read down the column to the first figure that is either equal to or greater than the MFC Channel Traffic calculated by the formulas given in Part 4 under the heading "MFC PROVISIONING."

— Read across to right-hand columns and determine (a) the number of MFC channels and (b) the number of MFC cards required.

Example

a Assume:

- ABSBH loop traffic of 450 CCS
- 1.5% delay over 0.5 seconds
- MFC channel traffic of 120 CCS.

b Using Table 7, Column 2:

- Number of MFC cards = 5.

If delay grade of service is 3% delay over 0.5 seconds, Column 3 of Table 26 gives the number of MFC cards = 4.

Note 4: Distribute the MFC cards among the network groups in proportion to the number of MFC trunks in each group. If a group contains more voice loops than MFC cards, install one card per voice loop starting from the loop with the lowest voice traffic and working upwards.

Note 5: The minimum number of MFC cards is 2.

MFC service change

MFC service change involves two types of assignments:

— assignment of MFC S/R circuit cards

— assignment of MFC features.

Note: Refer to *X11 Administration (553-3001-311)* for additional service change information.

Circuit card assignment

The following program assigns MFC hardware:

— DIGITONE* Receivers, Overlay Program 13

* DIGITONE is a trademark of Nortel Networks

MFC Implementation

LD 13 – Configure MFC units.

Prompt	Response	Description
REQ	NEW	Add new data to the system
TYPE	MFC	Multifrequency Compelled sender/receiver data block
TN	l s c u	Terminal number
	c u	Terminal number (Option 11)

LD 94 – Configure MFC table for outgoing trunks.

Prompt	Response	Description
REQ	NEW	Add new data to the system.
TYPE	R2MF	R2MFC data block
ICOG	OGT	Outgoing table
MAXT	(1) - 127	Maximum number of tables
TBNO	1 - 127	Table number

LD 16 – Configure R2MFC interworking timer in route data block.

Prompt	Response	Description
REQ	NEW	Add new data block to the system
TYPE	RDB	Route data block
CUST	xx	Customer Number associated with this route as defined in LD 15
ROUT	0 - 511	Route Number
	1 - 127	Route Number (Option 11)
TKTP	DID	Direct Inward Dialing route data block

...		
ICOG	IAO	Incoming and outgoing
...		
ACOD	x..x	Access Code for the trunk route
...		
MFC	YES	Multifrequency Compelled or MFC Signalling
...		
MFCO	1 - 127	MFC Outgoing table number as defined in LD 94
...		
CNTL	YES	Make changes to controls or timers
TIMR	MFC 128-(12032) -65408	Multifrequency Compelled Signaling (MFC) timer.
	MFID (0)-25088	R2MFC Interdigit timer. This timer is in the range of 0-25 seconds, in 128ms increments. A value of 0 will indicate that the timer is disabled and existing timing functionality will be used.
	MFO (0)-16256	MFC Transmit timer. If 0, then use current value of MFC Timer.
	MFR 128-(2048)-16256	MFC Reception timer.
	MFX 128-(4096)-16256	MFC Transmission timer.

LD 14 – Configure DID trunks with the MFC class of service.

Prompt	**Response**	**Description**
REQ	NEW	Add new data to the system
TYPE	DID	Direct inward dialing trunk data block
TN	l s c u	Terminal number
	c u	Terminal number (Option 11)
...		

XTRK	aaaa	Extended trunk. Prompted for superloops when defining the first unit where: aaaa = EXUT, XUT, XDID, XEM, or XCOT.
CUST	xx	Customer Number associated with this route as defined in LD 15
RTMB	0-511 1-254	Route number and Member number
	0-127 1-254	Route number and Member number (Option 11)
....		
CLS	MFC	R2 Multifrequency Compelled Signaling.

MFC maintenance

Refer to *X11 Maintenance (553-3001-511)* for a complete description of the MFC maintenance programs and a listing of the maintenance I/O codes.

MFD, overlay program 54

This diagnostic program tests card hardware by performing loop-back tests on both channels of the MFC S/R circuit card. These self-tests involve looping the Sender output of each channel back to the Receiver input. The MFD program performs this loop-back test on one S/R channel at a time. This program allows the status of the MFC S/R to be changed or displayed.

The MFD program can be loaded:

— by the Meridian 1 as a midnight routine or after every system load

— by maintenance personnel using TTY or maintenance 1 telephones.

MFC error handler

This is a resident program that monitors the number of MFC signaling errors. A one-word error field in the MFC block is initialized to zero. The MFC Error Handler allows a maximum of ten errors. After every successful use of the MFC channel, the error field is decremented by one, if it is not already at zero. After every failure of the MFC channel, the error field is incremented by one. An error message is printed whenever the error field exceeds the threshold of ten errors. The error message includes the MFC terminal number.

Meridian 1

Multifrequency Compelled Signaling

Description, Hardware and Engineering

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